SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 14
JULY 15, 1974

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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04 WATER QUANTITY MANAGEMENT AND CONTROL
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07 RESOURCES DATA
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08 ENGINEERING WORKS
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10 SCIENTIFIC AND TECHNICAL INFORMATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

DRAINAGE DENSITY AND EFFECTIVE PRECIPITATION,
C. M. Madduma Bandara.
Journal of Hydrology, Vol 21, No 2, p 187-190, February 1974. 1 fig, 11 ref.

Descriptors: *Erosion, *Geomorphology, *Drainage density, *Tropical regions, *Grasslands, Humid areas, Wet climates, Drainage patterns(Geologic), Hortons law.
Identifiers: *Ceylon(Sri Lanka region).

In the central hills of Sri Lanka, the relationship between drainage density and effective precipitation is significantly positive. This shows that above a certain critical level of effective precipitation (80-90) the relationship between drainage density and P/E index turns positive. Such a conclusion is in agreement with the results of recent work which shows that, in humid tropical areas, sediment yield reaches a maximum under grassland conditions and possibly reaches another peak where the impeding effect of vegetation cannot be increased by further increase of precipitation. (Knapp-USGS)
W74-07155

WATER YIELD, ANNUAL PEAKS AND EXPOSURE IN MOUNTAINOUS TERRAIN,
Forest Service (USDA), Moscow, Idaho. Forestry Sciences Lab.
N. Bethlahmy.
Journal of Hydrology, Vol 20, No 2, p 155-169, October 1973. 2 fig, 5 tab, 20 ref.

Descriptors: *Snowmelt, *Alpine, *Water yield, *Runoff forecasting, *Rocky Mountain Region, Ablation, Solar radiation, Topography, Flood forecasting, Streamflow forecasting, Peak discharge, Slopes, Mountains.

In steep, mountainous terrain of the western United States, where summer rains are negligible and annual runoff is primarily dependent on melting snow, the runoff distribution is such that a high energy recipient (HE) watershed generally yields more water per unit area than a low energy recipient (LE) watershed except during the latter's flood peak period, at which time the ratio of yields is reversed. HE watersheds peak sooner than their corresponding LE watersheds, but also vary more in their peaking date. The ratio of maximum peak flows may be greater or less than 1.0 depending on environmental circumstances. (Knapp-USGS)
W74-07165

NUMERICAL STUDIES OF TWO-DIMENSIONAL SATURATED-UNSATURATED DRAINAGE MODELS,
Oslo Univ. (Norway). Inst. of Geophysics.
For primary bibliographic entry see Field 2G.
W74-07168

CROSS-SPECTRAL ANALYSIS OF RAINFALL AND RUNOFF FOR RARITAN AND MULLICA RIVER BASINS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
E. L. Bourodimos, and A. M. Oguntuase.
Journal of Hydrology, Vol 21, No 1, p 61-79, January 1974. 9 fig, 1 tab, 11 ref.

Descriptors: *Rainfall-runoff relationships, Statistical methods, *Correlation analysis, Fourier analysis, Time series analysis, *New Jersey, Stochastic processes.
Identifiers: *Cross-spectral analysis, *Raritan River basin(N.J.), *Mullica River basin(N.J.).

Cross-correlation and cross-spectral analysis were employed in the analysis of rainfall and runoff in two river basins: the Raritan and Mullica River basins in New Jersey. Cross-covariance and coherence were studied in the correlograms for the following cases: (a) rainfall-runoff for each basin separately; (b) rainfall-rainfall analysis for two main meteorological stations in each of the basins; (c) runoff-runoff for two main gaging stations in each of the basins. From the estimates of the coherence at various frequencies, the cross-spectral analysis shows a highly nonlinear relationship between rainfall and runoff. A poor coherence of the annual cycles for each basin makes it difficult to predict the annual oscillations of runoff from those of rainfall by a linear regression model. The high coherence between rainfall (or runoff) at the first station and rainfall (or runoff) at the second station within the same basin at almost all frequencies establishes an accurate prediction on a linear basis. (Knapp-USGS)
W74-07183

THE EPA STORMWATER MANAGEMENT MODEL: A CURRENT OVERVIEW,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W74-07265

SOME GENERALIZED BETA DISTRIBUTIONS OF THE SECOND KIND HAVING DESIRABLE APPLICATION FEATURES IN HYDROLOGY AND METEOROLOGY,
Colorado State Univ., Fort Collins. Dept. of Statistics.
P. W. Mielke, Jr., and E. S. Johnson.
Water Resources Research, Vol 10, No 2, p 223-226, April 1974. 3 tab, 9 ref.

Descriptors: *Statistics, *Statistical methods, *Simulation analysis, Sampling, Variability, Statistical models, Mathematical studies.
Identifiers: Distribution functions.

Two distinct versions of the generalized beta distribution of the second kind are considered. These beta-type distributions compare favorably with the commonly used gamma and log normal distributions in their ability to fit selected sets of accumulated streamflow and precipitation amount data. The comparisons are based on empirical results associated with three different goodness of fit criteria. Since the cumulative distribution functions of these beta-type distributions are in closed form, they possess unique computational advantages over the gamma and log normal distributions. (Knapp-USGS)
W74-07412

ALGEBRAIC BOUNDEDNESS OF SAMPLE STATISTICS,
Geological Survey, Reston, Va. Water Resources Div.
W. Kirby.
Water Resources Research, Vol 10, No 2, p 220-222, April 1974. 1 tab, 2 ref.

Descriptors: *Statistics, *Statistical methods, *Simulation analysis, Sampling, Variability, Statistical models, Mathematical studies.
Identifiers: Distribution functions.

Some puzzling results from a computer simulation study are explained by showing that the sample skew coefficient has population-independent bounds depending only on the sample size. Similar results are obtained for the coefficient of variation of positive data, the maximum standardized deviate, and the standardized range. These bounds are called algerbraic bounds to emphasize that they are properties of the algebraic formulas defining the statistics; they are totally independent of any assumptions about the processes generating the samples for which the statistics are computer. (Knapp-USGS)
W74-07413

JUST A MOMENT,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.
J. R. Wallis, N. C. Matalas, and J. R. Slack.
Water Resources Research, Vol 10, No 2, p 211-219, April 1974. 6 fig, 4 tab, 8 ref.

Descriptors: *Statistics, *Statistical methods, *Monte Carlo method, Mathematical studies, Variability, Probability, Distribution patterns.
Identifiers: *Distribution functions.

The distribution functions for three statistics, the mean, standard deviation and coefficient of skewness, for small samples from various distributions were obtained by Monte Carlo experiments. Sample sizes of 10 (10) 90 were considered, and the distributions used were the normal, Gumbel (extreme value type 1), log normal, Pearson type 3 (gamma), Weibull, and Pareto type 1 (Pearson type 4). Values of the coefficient of skewness used in generating the samples were in the range 0.0 to 15.0. Pronounced skews, biases, and constraints in the sampling properties of the statistics were observed. Examples of the available graphs of the distribution functions are presented. (Knapp-USGS)
W74-07414

PREDICTING PESTICIDE RUNOFF FROM AGRICULTURAL LAND: A CONCEPTUAL MODEL,
Environmental Protection Agency, Athens, Ga. Agro-Environmental Systems Branch.
For primary bibliographic entry see Field 5B.
W74-07427

GENERATION MODELS FOR SYNTHETIC ANNUAL AND MONTHLY FLOWS FOR SOME INDIANA WATERSHEDS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
J. W. Delleur, and I. T. Kisisel.
Indiana Academy of Science Proceedings, Vol 2, p 208-213, 1972. 2 fig, 1 tab, 7 ref. OWRR-A-020-IND (4).

Descriptors: *Model studies, *Hydrograph analysis, *Time series analysis, *Watersheds(Basins), *Indiana, Flow, Markov processes, Discharge, Runoff, Precipitation, Geomorphology, *Synthetic hydrology.
Identifiers: *Autoregressive process, Fiering type logarithms.

A first order autoregressive process can be used to generate annual flows. The mean annual flow and the rank one serial correlation coefficient were related to watershed and climatological properties. A first order Markov process of the Fiering type adequately simulates the sequence of normalized logarithms of monthly flows. The means and standard deviations of the logarithms of the monthly flows and the autoregressive constant were related to climatological and basin characteristics.
W74-07431

A COMPUTER ATLAS OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
J. W. Delleur, M. T. Lee, and D. Blank.
Indiana Academy of Science Proceedings, Vol 82, p 222-226, 1972. 1 fig, 11 ref. OWRR B-008-IND (14).

Descriptors: *Geomorphology, *Drainage density, *Small watersheds, *Indiana, *Maps, Topog-

raphy, Streams, Hydrologic data, Networks, Data processing, Computers, Rainfall, Runoff, Drainage patterns, Contours, Hydrologic analysis, Unit hydrograph, Hydrologic models.
Identifiers: *Geomorphologic data, *Stream network, Instantaneous hydrographs.

Banks of hydrologic and geomorphologic data for Indiana small watersheds were prepared for computer use. Four major types of data were collected: rainfall and runoff data for 55 watersheds; and drainage networks and topographic data for 34 of these watersheds. The data were loaded on four magnetic tapes. The first tape contains the single storm rainfalls and runoffs; the second, the single storm rainfall excesses and direct runoff hydrographs; the third, the planforms of stream networks; and the fourth, the elevation contours of the watersheds. Such data are useful in hydrograph analysis, estimation of instantaneous hydrographs, identification and calibration of hydrologic models for runoff estimation. They have applications in drainage design, development and management of water resources.
W74-07432

COMPARISON OF RAINFALL-RUNOFF MODELS FOR URBAN AREAS,
India Inst. of Tech., Kanpur.
P. B. S. Sarma, J. W. Delleur, and A. R. Rao.
Journal of Hydrology, Vol 18, p 329-347, 1973. 6 fig, 3 tab, 20 ref. OWRR B-002-IND(6).

Descriptors: *Urban runoff, *Instantaneous unit hydrograph, *Rainfall-runoff relationships, *Precipitation excess, Urban drainage, Base flow, Mathematical models, Hydrographs.
Identifiers: Fourier transform method, Nash model, Double routing method, Linear channel-linear reservoir method.

The relative regeneration performances of five linear rainfall excess-direct runoff models are compared for several urban watersheds with varying degrees of development. The five models considered are the single linear reservoir, the Nash model, the double routing method, the linear channel-linear reservoir model and the instantaneous unit hydrograph (IUH) obtained by the Fourier transform method. The IUH always gives the best regeneration performance among the four conceptual models tested. The optimized single linear reservoir constant differs from the theoretical time lag value, but is related to the latter, and for each watershed varies from storm to storm. For larger watersheds the Nash model gives the best regeneration performance among the four conceptual models tested. The model parameters for each watershed are found to vary from storm to storm. The quality of regeneration for larger basins is less than that found for the smaller basins.
W74-07463

A RAINFALL-RUNOFF MODEL BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
J. W. Delleur, and M. T. Lee.
In: Proceedings, Symposium on the Design of Water Resources Projects With Inadequate Data, Madrid, Spain, p 75-87, June 1973. 4 fig, 19 ref. OWRR B-008-IND(13).

Descriptors: *Rainfall-runoff relationships, *Hydrographs, *Overland flow, *Slopes, *Drainage density, *Remote sensing, *Aerial photography, Geomorphology, Precipitation, Runoff, Base flow, Percolation, Drainage systems, Stream flow, Aerial sensing, Photography, Physical models, Watersheds(Basins), Networks.
Identifiers: *Stream network, Stream order, Infrared color, Dynamic contributing area model, Linear routing.

Physical models of the rainfall-runoff process are better suited than either stochastic or black box models for areas with limited data. The model parameters must have a physical significance, be convenient to obtain and their number should be small. The framework of a model meeting these objectives is proposed and is based primarily on the geomorphologic characteristics of the stream network obtainable from maps or from aerial photographs. There is analytical and experimental evidence that hydrographs are dominated by direct runoff from very short overland flow paths from precipitation on transient, near channel wetlands. This wetland area is dynamic in the sense that it varies in terms of the history of the excess of the precipitation over the 'B' horizon permeability. The distribution of the dynamic contributing area along the main stream is obtained under the assumptions that the velocity of flow along the stream network is uniform, that the drainage density is a constant within a given watershed and that the first order streams are uniformly distributed in the basin. The runoff from the dynamic contributing area is then routed through the synthesized stream network to obtain the direct runoff at the basin outlet.
W74-07464

PROBLEM OF CALCULATING DEPTH OF THE QUASIUNIFORM LAYER OF THE OCEAN (K VOPROSU O RASCHETE TOLSHCHINY KVAZIODNORODNOGO SLOYA OKEANA),
Gidrometeorologicheskii Institut, Leningrad (USSR).
I. N. Rusin.
Meteorologiya i Gidrologiya, No 6, p 62-69, June 1973. 2 fig, 11 ref.

Descriptors: *Oceanography, *Depth, *Boundaries(Surfaces), *Boundary layers, *Temperature, Thermocline, Heat balance, Seasonal, Heat transfer, Turbulence, Mixing, Model studies, Equations.
Identifiers: USSR, Heat flux.

A method of derivation of equations and some solutions to the equations simulating annual movement of the depth of the quasiuniform layer of the ocean are considered. The model was based on laboratory experiments on a study of the propagation of turbulence from a surface into a liquid and on a procedure for constructing boundary conditions at the lower boundary of a quasihomogeneous layer. Despite a large number of simplifications, the model obtained gives a qualitatively true picture of the evolution of the investigated value. (Josefson-USGS)
W74-07506

MATHEMATICAL SIMULATION OF SUBSURFACE FLOW CONTRIBUTIONS TO SNOWMELT RUNOFF, REYNOLDS CREEK WATERSHED, IDAHO,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2F.
W74-07516

CALIBRATING A WATER YIELD MODEL FOR SMALL UNGAGED WATERSHEDS,
Kentucky Dept. of Natural Resources, Frankfort. Division of Water.
J. E. Jarboe, and C. T. Haan.
Water Resources Research, Vol 10, No 2, p 256-262, April 1974. 1 fig, 10 tab, 8 ref.

Descriptors: *Water yield, *Mathematical models, *Kentucky, Systems analysis, Rainfall-runoff relationships, Optimization, *Small watersheds.

A four-parameter water yield model was calibrated on 17 Kentucky watersheds by relating the model parameters to watershed topographic, geologic, and soil characteristics. The relationships were tested by comparing observed and simulated runoff records from six watersheds that were not contained in the original 17 watersheds. The results show that the water yield model can be satisfactorily applied to ungaged basins. (Knapp-USGS)
W74-07519

STREAMFLOW SIMULATION: 3. THE BROKEN LINE PROCESS AND OPERATIONAL HYDROLOGY,
Ecole Polytechnique, Montreal (Quebec). Hydraulic Div.
J. M. Mejia, D. R. Dawdy, and C. F. Nordin.
Water Resources Research, Vol 10, No 2, p 242-245, April 1974. 11 ref.

Descriptors: *Synthetic hydrology, *Simulation analysis, *Statistical models, Markov processes, Stochastic processes, Regression analysis, Probability, Variability.
Identifiers: *Hurst phenomenon, Operational hydrology, Broken-line processes.

Broken line processes can be used to produce a standardized Gaussian process. An extension of the theory of the broken line process leading to the generation of processes preserving the mean, the variance, and a skewness coefficient different from zero is presented. The broken line process allows the modeling of cross-correlated sequences, for which it is possible to reproduce the value of H, the second spectral moment for a continuous process or the first serial correlation coefficient for a discrete one, and the first three moments for each of the sequences as well as the lag zero cross correlation among them. In addition, by proper structuring of the broken line process, parameter estimates may be preserved by simple algorithms. The addition of simple broken line processes is a useful operational tool for the synthesis of skewed multivariate sequences exhibiting the Hurst phenomenon. It can be used for continuous as well as discrete processes. (See also W72-13478 and W72-13479) (Knapp-USGS)
W74-07520

EFFECT OF GRAZING ON RUNOFF FROM TWO SMALL WATERSHEDS IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), La Crosse, Wis. Watershed Lab.
For primary bibliographic entry see Field 4C.
W74-07525

2B. Precipitation

AGROCLIMATIC REGIONS OF RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07102

SOURCE AND BUDGET OF SULFATE IN PRECIPITATION FROM CENTRAL ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 5B.
W74-07164

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUB-OPTIMIM WEATHER,
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-07342

AN IRRIGATION SCHEDULING MODEL WHICH INCORPORATES RAINFALL PREDICTIONS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-07440

EFFECT OF AGNES FLOODS ON ANNUAL SERIES IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W74-07455

2C. Snow, Ice, and Frost

PROBABILITY DISTRIBUTION OF SNOW COURSE DATA FOR CENTRAL ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
L. E. Cary, and R. L. Beschta.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1973 meeting of the Arizona Section -- AWRA and the Hydrology Section -- Arizona Academy of Science, May 4-5, 1973, Tucson, Arizona, vol 3, p 8-16 (1973). 8 fig, 3 tab, 8 ref.

Descriptors: *Snowfall, *Water yield, *Probability, *Distribution patterns, *Water equivalent, Snowpacks, Snow, Ponderosa Pine trees, Coniferous trees, Water supply, Watershed(Basins), Snowmelt, Ablation, Regression analysis, Statistics, *Arizona.
Identifiers: Snow course.

A preliminary study of probability distributions for use on snowpack accumulation in the central Arizona highlands was made from 22 snow courses selected as having 10 or more years of available records. Due to the frequent occurrence of zero water equivalent value, application of a single continuous probability distribution is precluded. By means of two distributions, however, the snowpack water equivalent can be assessed by a binomial distribution describing the probability of snow, and a lognormal distribution describing the probability of water equivalent. The area chosen for detailed analysis is where the headwaters of many of Arizona's major river systems occur. (Mastic-Arizona)
W74-07094

WATER YIELD, ANNUAL PEAKS AND EXPOSURE IN MOUNTAINOUS TERRAIN,
Forest Service (USDA), Moscow, Idaho. Forestry Sciences Lab.
For primary bibliographic entry see Field 2A.
W74-07165

AVALANCHE STUDIES (1971-1972),
Washington Univ., Seattle. Geophysics Program; and Washington Univ., Seattle. Dept. of Civil Engineering.
E. R. LaChapelle, C. B. Brown, and R. J. Evans.
Available from NTIS, Springfield, Va. 22151 as PB-221 080; Price $4.85 printed copy; $1.45 microfiche. Washington State Highway Department Research Program Report 8.3, September 1972. 81 p, 17 fig, 8 plate, 2 tab, 10 ref, append. DOT Y-1301.

Descriptors: *Avalanches, *Snow management, *Washington, Highways, Stress, Strain, Creep, Mass wasting, Snowpacks, Temperature, Precipitation(Atmospheric), Snowfall.
Identifiers: *Japan.

The University of Washington program in avalanche studies in the North Cascades is operated in conjunction with the Washington State Highway Department. A complete bibliography of snow clearing methods used in Japan was compiled, and Japanese avalanche problems were studied. The observed state of stress in fallen snow and subsequent mechanics of slab avalanching were studied. Theory was correlated with observed avalanching. Important mechanical parameters of the snow are required for the engineering application of the theory. These strength, glide and creep properties are being collected at test sites in the North Cascades. (Knapp-USGS)
W74-07319

A SCANNING ELECTRON MICROSCOPE STUDY OF SURFACE TEXTURES OF QUARTZ GRAINS FROM GLACIAL ENVIRONMENTS,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W74-07331

STUDIES OF THE INGREDIENTS VARIATION OF THE SAKE-GAWA RIVER, A TRIBUTARY OF THE MOGAMI RIVER (IN JAPANESE),
Yamagata Prefectural School for the Blind, Kaminoyama (Japan).
For primary bibliographic entry see Field 2K.
W74-07360

STUDIES ON ORGANISMS FOUND IN ARCTIC SEA ICE,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W74-07487

WINTER-REGIME THERMAL RESPONSE OF HEATED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W74-07511

SNOW ACCUMULATION AND SNOWMELT AS INFLUENCED BY A SMALL CLEARING IN A LODGEPOLE PINE FOREST,
Forest Service (USOA) Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
H. L. Gary.
Water Resources Research, Vol 10, No 2, p 348-353, April 1974. 8 fig, 1 tab, 9 ref.

Descriptors: *Snowpacks, *Forests, *Snowmelt, *Land clearing, *Wyoming, Forest management, Watershed management, Water equivalent, Water yield.

Snow accumulation increased under a thinned lodgepole pine stand about 35 feet tall and 80 years old for two winter seasons before and two seasons after cutting a clearing 1 tree height wide and 5 tree heights long. The clearing was on a gently sloping plateau 9000 feet above msl and was oriented perpendicularly to the prevailing southwest wind. The maximum snowpack water equivalent the first year after clearing averaged 13.1 inches in the upwind forest, 16.2 inches in the clearing, and 12.2 inches in the downwind forest zone. The snow accumulation pattern was similar the second year. The increased snow catch in the clearing was offset by the snow deficit in the downwind forest. The clearing affected the distribution of snow over the area but not the total amount of snow water equivalent. Melt rates in the clearing were about twice those in the interior forest zones. Near the middle of the melt season the clearing as a whole contained 12% less snow water equivalent than the interior forest. (Knapp-USGS)
W74-07526

2D. Evaporation and Transpiration

EVAPOTRANSPIRATION ON A PALOUSE WATERSHED,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
M. Molnau, and D. J. Davis.
Paper No 73-218 presented at 1973 Annual Meeting, American Society of Agricultural Engineers, University of Kentucky, Lexington, June 17-20, 1973. 9 p, 6 fig, 2 tab, 7 ref. OWRR A-029-IDA (6).

Descriptors: *Evapotranspiration, *Idaho, *Barley, *Soil moisture, *Watershed management, Measurement, Evaporation pans.
Identifiers: *Palouse watershed(Ida-Wash), Penman method.

Evapotranspiration of a spring barley crop was estimated by measuring soil moisture changes. An evaporation pan, the Penman method, and the Jensen-Haise method were used to estimate evapotranspiration. On an overall evaluation, the evaporation pan is unacceptable while the other two methods were acceptable with the Penman method to be preferred.
W74-07087

EVAPORATION FROM AN IRRIGATED RICE CROP IN A SEMI-ARID REGION,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
A. R. G. Lang, G. N. Evans, and P. Y. Ho.
Paper presented at First Australasian Conference on Heat and Mass Transfer at Monash University, Melbourne, Australia, May 23-25, 1973. 6 p, 1 fig, 1 tab, 16 ref.

Descriptors: *Evapotranspiration, *Advection, *Rice, *Flood irrigation, Semi-arid climates, Air-earth interface, Consumptive use, Energy budget, Irrigation effects, Transpiration, Water loss, Water balance, Heat balance, *Australia.

An assessment is made of the fluctuations in evapotranspiration rate associated with the extreme advective conditions of flood-irrigated rice crops bounded by a semi-arid area. The influence of the humid-arid boundary is theoretically examined and compared to experimental measurements of heat and water flux determined along a transect through a rice field. The theoretical equation is found to be an adequate simulation of the field situation. (Muller-Arizona)
W74-07096

MODEL TESTS WITH THIN SHEETS TO REDUCE EVAPORATION,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 3B.
W74-07103

EVAPORATION OF WATER FROM SAND: 5. THE EFFECT OF EVAPORATION ON THE CONCENTRATION OF SALTS DISSOLVED IN WATER STORED IN SAND,
National Inst. for Water Research, Windhoek (South-West Africa).
D. H. R. Hellwig.
Journal of Hydrology, Vol 21, No 2, p 101-110, February 1974. 2 fig, 4 tab, 2 ref.

Descriptors: *Evaporation, *Dissolved solids, *Mass transfer, Sands, Capillary action, Salinity, Evaporimeters, Soil water movement, *Salts.

To determine the effect of evaporation on the concentration of salts dissolved in water stored in sand, three different sand mixtures were studied and the water table was maintained at three different levels. After 71 weeks the average salt concentration of the water in each tank was practically the same as it was 12 weeks after the start of the test, which indicated that salts were removed from solution during the test period. When water was transported to the sand surface by capillary action, the salts removed from solution accumulated in a thin sand layer near the sand surface. If capilllary action did not transport water to the sand surface, salts removed from solution were accumulated 10 to 15 cm above the water table. With increasing evaporation, proportionately greater amounts of dissolved salts are removed from water stored in sand. This relationship was expressed as a hyperbolic function. (See also W73-07055 and W73-07056) (Knapp-USGS)

W74-07169

SOLAR EVAPORATION CONTROLLED IRRIGATION SYSTEM,
D. F. Marean.
U.S. Patent No 3,786,832, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 918, No 4, p 1414, January 22, 1974.

Descriptors: *Patents, *Irrigation systems, *Evaporation pans, Rainfall, Equipment, Control systems, Surface irrigation, Water distribution(Applied), Solar radiation, Water delivery, Soil water.
Identifiers: *Solar evaporation, Soil moisture.

Control for a land irrigation system is actuated in response to the rate of solar evaporation of water from an evaporator pan and the rate of evaporation from land. These are so related that the pan moves to initiate irrigation only when the land actually requires water. When the pan is filled with water from rainfall or from the supply line, a valve closes to terminate the irrigation operation. However, when solar evaporation of water form the pan has depleted the weight of the water to the extent that the resilient means can pivot the pan to the first pollution, the valve is opened to initiate an irrigation operation. (Sinha-OEIS)
W74-07211

IRRIGATION AND SPRINKLER SYSTEM,
Clemar Mfg. Corp., Azusa, Calif. Assignee.
For primary bibliographic entry see Field 3F.
W74-07212

INVESTIGATION OF THE RELATION OF GROUNDWATER EVAPORATION TO LITHOLOGICAL STRUCTURE OF THE ZONE OF AERATION (K IZUCHENIYU ZAVISIMOSTI ISPARENIYA GRUNTOVYKH VOD OT LITOLOGICHESKOGO STROYENIYA ZONY AERATSII),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
K. G. Ganiyev.
Uzbekskiy Geologicheskiy Zhurnal, No 6, p 20-21, 1973. 1 tab, 2 ref.

Descriptors: *Groundwater, *Evaporation, *Petrology, *Zone of aeration, Water table, Evapotranspiration, Lysimeters, Loam, Clay loam, Sands, Cotton, Alfalfa.
Identifiers: *USSR(Uzbek SSR).

Groundwater evaporation depends on climatic and water-management conditions, soil particle size and solid-residue content in groundwater, and on character of the active cover. Evaporation from coarse loam planted to cotton was 60% less than that from clay loam. At lysimeters where alfalfa was grown, evaporation from coarse loamy sand was 58% less than that from clay loam. The relation of groundwater evaporation to lithological composition of soils was established on the basis of data of lysimeter investigations conducted by the Fergana Hydrogeological Station in 1956-62. (Josefson-USGS)
W74-07529

2E. Streamflow and Runoff

FLOOD PLAIN INFORMATION-NEUSE AND TRENT RIVERS AND JACK SMITH CREEK, NEW BERN, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07073

FLOOD PLAIN INFORMATION-NEUSE RIVER AND BUFFALO CREEK, SMITHFIELD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07074

FLOOD PLAIN INFORMATION: BURDENS AND TWO BOTTLE CREEKS AT RESEARCH TRIANGLE AREA, DURHAM COUNTY, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07075

FLOOD PLAIN INFORMATION - GLADE CREEK, VINTON, VIRGINIA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07076

STATE FLOOD CONTROL PROGRAM.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4A.
W74-07111

THE FORECASTING OF STREAMFLOW USING THE METHOD OF CHARACTERISTIC MODES,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07178

A SYNTHETIC MODEL FOR DAILY STREAMFLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
N. M. D. Green.
Journal of Hydrology, Vol 20, No 4, p 351-364, December 1973. 7 fig, 3 tab, 4 ref.

Descriptors: *Streamflow forecasting, *Synthetic hydrology, *Statistical models, Time series analysis, Rainfall-runoff relationships.
Identifiers: *Great Britain(England).

A model for synthesizing daily average streamflow data is presented; it is suitable for most rivers in Great Britain. The method is based on a linear interpolation of the logarithms of 5-day average flows produced using a statistical model. The 5-day model preserves the long-term statistical characteristics of the daily data, while the short-term characteristics such as hydrograph shape are imposed by the interpolation method. A stochastic error term is superimposed on the interpolated daily flows. This term represents the nondeterministic component of the daily time series. The riverflow in the Severn at Bewdley was used to demonstrate both the analysis of actual data and the generation of synthetic data. The technique was applied to data from two other rivers with widely differing characteristics to demonstrate the range of the method. (Knapp-USGS)
W74-07179

AN INNOVATIVE AUTOMATIC STREAM GAGING METHOD,
Oklahoma Univ., Norman. School of Engineering and Environmental Science.
For primary bibliographic entry see Field 7B.
W74-07181

CROSS-SPECTRAL ANALYSIS OF RAINFALL AND RUNOFF FOR RARITAN AND MULLICA RIVER BASINS IN NEW JERSEY,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2A.
W74-07183

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1973,
Geological Survey, Honolulu, Hawaii.
R. H. Nakahara.
Progress Report No 16 (Basic data release), January 1974. 175 p, 5 fig, 1 tab.

Descriptors: *Floods, *Hawaii, *Hydrologic data, *Flood data, Peak discharge, Data collections.

Floods--mainly because of the high frequency of intense rainfall--are common in Hawaii. Flood damages to crops, homes, highways, and other facilities, and pollution of bays and estuaries from storm runoff and sediment discharge occur nearly every year. Flood data are obtained through a network of stream-gaging and peak-discharge stations throughout the State. At the close of the 1973 water year, flood data were being collected at 53 regular gaging stations and 103 crest-stage gaging stations on Kauai, Oahu, Molokai, Maui, and Hawaii. Although peaks occurred during 11 months of the year, only the months of October, February, and March denoted excessive runoff throughout the State. (Knapp-USGS)
W74-07185

WATER RESOURCES OF THE TAUNTON RIVER BASIN SOUTHEASTERN MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-07190

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1974.
Geological Survey, Austin, Tex.
Water-Resources Investigations Report, February 1974. 34 p.

Descriptors: *Water resources, *Texas, *Investigations, Groundwater, Surface waters, Data collections, Gaging stations, Hydrologic data, Streamgages, Water wells.

Water-resources investigations by the U.S. Geological Survey in Texas consist of the collection of basic records through the hydrologic-data network, interpretive studies, and research projects. The water-resources projects and activities of the Geological Survey in Texas for the 1974 fiscal year (July 1, 1973, to June 30, 1974) are described. In Texas, continuing measurements and analyses are made of streamflow, reservoir contents, chemical quality of water, sediment in streams and reservoirs, water levels in wells, and land-surface subsidence. Modern computer techniques are being used successfully in the collection and publication of water data. As of June 30, 1973, 567 stream-gaging, stage-only, and reservoir-contents stations were in operation. The fiscal 1974 program provides for three water-quality surveys each of Lake Meredith, Greenbelt Reservoir, Lake Arlington, Livingston Reservoir, Lake Conroe, Hubbard Creek Reservoir, Possum Kingdom Reservoir, Lake Granbury, Whitney Lake, Belton Lake, Canyon Lake, and Lake Corpus Christi, and two surveys of Sam Rayburn Reservoir. Onsite determinations will be made of specific conductance, dissolved oxygen, temperature, and pH. Samples will be collected for laboratory analyses during each survey. (Knapp-USGS)
W74-07321

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
R. D. Steger.
Data Report, 1973. 109 p, 1 fig, 4 tab, 3 ref.

Descriptors: *Urban hydrology, *Texas, *Hydrologic data, *Data collections, Urban runoff, Water quality, Recharge, Limestones, Storm runoff, Water pollution sources.
Identifiers: *San Antonio(Tex).

A compilation and analysis of hydrologic data collected in the San Antonio, Texas, urban area for the 1971 water year are presented. The objectives of the San Antonio urban hydrology study are: to provide data showing the effects of various stages of urbanization on flood discharge and runoff, and to provide water-quality data showing chemical constituents, nutrients, biochemical oxygen demand, pesticides, and sediment in surface-water runoff from floods of various magnitudes during all seasons of the year from areas with different types of utilization. Water-quality data have been collected from watersheds in various stages of urban development at most of the gaging stations in the San Antonio urban area. This water-quality program provides data on the concentration of pollutants as a result of runoff from these watersheds. In addition, these data provide a relationship of water-quality parameters to discharge and seasonal conditions. The importance of water quality in this area is unique because of the large amounts of surface-water runoff recharged to the Edwards and associated limestones, which is the major aquifer supplying groundwater for domestic supply, municipal supply, irrigation, and industrial use in the San Antonio area. (Knapp-USGS)
W74-07323

PREDICTING PESTICIDE RUNOFF FROM AGRICULTURAL LAND: A CONCEPTUAL MODEL,
Environmental Protection Agency, Athens, Ga. Agro-Environmental Systems Branch.
For primary bibliographic entry see Field 5B.
W74-07427

PARAMETER IDENTIFICATION IN FIELD PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 7C.
W74-07428

GENERATION MODELS FOR SYNTHETIC ANNUAL AND MONTHLY FLOWS FOR SOME INDIANA WATERSHEDS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07431

A COMPUTER ATLAS OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07432

EFFECT OF AGNES FLOODS ON ANNUAL SERIES IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
B. M. Reich.
Available from the National Technical Information Service as PB-231 871; $7.00 in paper copy, $1.45 in microfiche. Pennsylvania State University Institute for Research on Land and Water Resources Research Publication, No 74, July 1973. 72 p, 9 fig, 30 ref. OWRR A-016-PA(4).

Descriptors: *Floods, *Hurricanes, *Pennsylvania, *Historic floods, Peak discharge, Flood frequency, Flood recurrence interval, Statistics, Hydrologic data, Flood forecasting.
Identifiers: *Hurricane Agnes(1972).

Maximum flood discharges for Hurricane Agnes, 1972, on 44 Pennsylvania watersheds were compared with historic flood records. Mathematical frequency curves were fitted to each series according to the Gumbel, log-Gumbel, and log-Pearson Type III methods. The 1972 floods were less than 4.8 times the average annual flood peak in all but 8 of the 44 cases. The threshold was established in previous studies as the ratio between a 1,000-year flood and an average annual flood, equivalent to about a 5% chance of being exceeded by a worse flood once or more in the next 50 years. Most locations have high probabilities of being struck by far worse floods than they experienced in 1972. The worst area of recorded flood during Agnes, measured at the East Mahantango Creek, was 11.5 times its mean annual flood. (Knapp-USGS)
W74-07455

PROBLEM OF CALCULATING DEPTH OF THE QUASIUNIFORM LAYER OF THE OCEAN (K VOPROSU O RASCHETE TOLSHCHINY KVAZIODNORODNOGO SLOYA OKEANA),
Gidrometeorologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 2A.
W74-07506

STREAMFLOW SIMULATION: 3. THE BROKEN LINE PROCESS AND OPERATIONAL HYDROLOGY,
Ecole Polytechnique, Montreal (Quebec). Hydraulic Div.
For primary bibliographic entry see Field 2A.
W74-07520

A MIXING CELL MODEL FOR LONGITUDINAL DISPERSION IN OPEN CHANNELS,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
For primary bibliographic entry see Field 8B.
W74-07527

FIRST CHARACTERIZATION OF THE RUNOFF FROM THE WATERSHED OF THE MANSO SUPERIOR RIVER AND ITS BASINS (ARGENTINA), (IN SPANISH),
Universidad Nacional del Sur, Bahia Blanca (Argentina).
J. A. Luque.
Rev Invest Agropecu Ser 3 Clima Suelo. Vol 8, No 2, p 75-99. 1971, Illus, (English summary).
Identifiers: *Argentina(Manso Superior River), *Hydrographs, River basins, *Runoff, Watershed.

The river beds are characterized and the main parameters are calculated to obtain the synthetic unit hydrograph. An example of application for a precipitation of the compound synthetic unit hydrograph type is developed, attaining in each case the final ordinates of QQ total for an imaginary hydrograph.--Copyright 1973, Biological Abstracts, Inc.
W74-07536

2F. Groundwater

GROUNDWATER GEOLOGY OF FORT VALLEY, COCONINO COUNTY, ARIZONA,
For primary bibliographic entry see Field 4B.
W74-07092

WATER RESOURCES SEMINAR SERIES NO. 2.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W74-07133

HYDROGEOLOGY OF CARBONATE AND VOLCANIC ROCKS--SIMILARITIES AND CONTRASTS,
Missouri Univ., Columbia. Dept. of Geology.
S. N. Davis.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 3-9. 2 fig, 1 tab, 15 ref,

Descriptors: *Hawaii, *Aquifer characteristics, *Hydrogeology, *Wells, Chemical properties, Rocks, Permeability.
Identifiers: *Carbonate rocks, Volcanic rocks, Oahu(Hawaii).

The hydrogeologic properties of tuff, chalk, lava flows, and Late Cenozoic rock are examined. Porosity of each is found to be 35-45%, 20-45%, 10-30%, and 15-30% respectively. Permeability of tuff and chalk, however, is so low as to make them poor aquifers, although welded tuff and cherty chalk, both of which are relatively brittle and tend to develop fractures creating rocks with significant permeability, form locally important aquifers in western United States and southeastern Great Britain. In contrast, lava flows of recent volcanic rock exceed 200 darcys in many areas, while Lake Cenozoic rock was found to exceed 400 darcys. A brief examination suggests that the statistical distribution of hydrological properties might provide useful information in regional planning decisions. In particular, it is contended that the knowledge of the statistical distribution of well and gallery yields is of great value in predicting the chances of obtaining a specified well yield for a given investment. (See also W74-07133) (Schroeder-Wisconsin)
W74-07134

DEVELOPMENT OF DIKE STORED WATER BY DRILLING, WAIHEE, OAHU,
Honolulu City and County Board of Water Supply, Hawaii.
C. Lao.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 63-73, 5 fig, 1 tab, 2 ref,

Descriptors: *Hawaii, *Aquifers, *Aquicludes, Groundwater barriers, Water resources, Drilling, Water supply, Wells, Pressure head.
Identifiers: *Oahu(Hawaii), Waihee Valley(Oahu), Inclined wells.

Development of underground dike storage water by angle drilling is examined through a recent project conducted on Oahu, Hawaii. Dike water represents a valuable asset to the island, both because its higher location allows delivery through gravity flow and because its low content of dissolved minerals and general absence of coliform bacteria. While it is assumed that dike storage represents a large future source of water, the described study's small size prevented an actual determination of the maximum potential. The inclined drilling method was shown to have an approximate 10:1 advantage over the existing method of tunneling. Additionally, drilling results in substatial conservation of water otherwise lost during tunnel construction. A comparison of a horizontal versus the angle drilling method found that while the latter required greater drilling than the former, it also increased the well efficiency such that it represented the best technique. (See also W74-07133) (Schroeder-Wisconsin)
W74-07137

HYDROGEOLOGY OF THE SASSO LUNGO GROUP, A DOLOMITIC REEF STOCK IN THE ALPINE DOLOMITES OF NORTH ITALY,
Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences.
G. B. Engelen.
Journal of Hydrology, Vol 21, No 2, p 111-130, February 1974. 10 fig, 2 tab, 5 ref.

Descriptors: *Hydrogeology, *Carbonate rocks, *Dolomite, Limestones, Fractures(Geologic), Water chemistry, Springs, Groundwater movement, *Aquifer characteristics, Aquicludes.
Identifiers: *Italy(Sasso Lungo).

The hydrogeological characteristics of the formations of the Sasso Lungo Group, Italy, are discussed. The central reef mass forms the main

aquifer. It is embedded in impervious formations. The Sasso Lungo group forms an isolated mountain mass in the Italian Dolomites in the SE Alps. The group has an area of 9 sq km and its elevation ranges from plus or minus 2000-3000 m. The central part consists of an exhumed, dolomitized reef of Triassic age, which has subsided by gravity tectonics partly into the surrounding and underlying plastic Permian and Triassic formations. The discharge of snowmelt water and rain takes place through a few large springs around the group at some distance from the reef. The springs are hydraulically connected with low subterranean overflow points in the impervious rim of the reef through natural conduits of permeable moraines and Quaternary valley fills. The central dolomite aquifer shows no signs of karst drainage. The water moves through a dense network of fractures and joints, and it probably has a free, fluctuating water table. Groundwater divides coincide in most cases with surface drainage divides. All springs and surface waters were mapped and sampled during the summer and fall periods from 1966 through 1968. The chemical composition of the spring waters was very useful in tracing their origin. (Knapp-USGS)
W74-07153

CRITICAL ANALYSIS OF THE ALTERNATING DIRECTION IMPLICIT METHOD OF AQUIFER ANALYSIS,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton.
Journal of Hydrology, Vol 21, No 2, p 153-172, February 1974. 8 fig, 1 tab, 6 ref.

Descriptors: *Finite element analysis, *Groundwater movement, *Mathematical models, Aquifers, Equations, Discharge(Water), Water yield, Numerical analysis.

The alternating direction implicit method, when used for aquifer analysis, may produce to erroneous results. By a careful examination of the effect of various factors, such as external boundaries, variable mesh intervals, internal boundaries with fixed heads, re-entrant boundaries and leakage, the occasions when these errors are serious were identified. Techniques which can avoid these errors and lead to reliable numerical solutions are given. (Knapp-USGS)
W74-07154

HEAT DISPERSION EFFECT ON THERMAL CONVECTION IN A POROUS MEDIUM LAYER,
Technion-Israel Inst. of Tech., Haifa. Dept. of Civil Engineering.
H. Rubin.
Journal of Hydrology, Vol 21, No 2, p 173-185, February 1974. 3 fig, 13 ref.

Descriptors: *Convection, *Dispersion, *Diffusion, *Heat transfer, *Porous media, Geothermal studies, Groundwater movement, Mass transfer, Water circulation.

Thermal convection resulting from vertical temperature gradients in porous media was analyzed, taking into account the effect of heat dispersion. Heat dispersion increases the thermal stability of the flow field and may inhabit the appearance of convection currents. Longitudinal as well as lateral dispersivities affect the thermal stability and the dimensions of the convection cells. As a result of convection currents, horizontal streamlines in the steady state are distorted. The convection currents appear as oscillations in the flow field. The frequency of these oscillations depends on the barycentric steady state horizontal flow velocity, the ratio between the longitudinal and lateral dispersivities, and the aquifer thickness. (Knapp-USGS)
W74-07156

KARST PROCESSES OF THE EASTERN UPPER GALILEE, NORTHERN ISRAEL,
Hebrew Univ., Jerusalem (Israel), Dept. of Geography.
R. Gerson.
Journal of Hydrology, Vol 21, No 2, p 131-152, February 1974. 10 fig, 1 tab, 14 ref.

Descriptors: *Karst, *Karst hydrology, *Geomorphology, Limestones, Erosion, Topography, Springs, Water chemistry, Calcium, Magnesium, Water balance, Arid lands.
Identifiers: *Israel(Galilee).

Karst processes dominate most of the geomorphic activity in the Upper Galilee, Israel. The rocks of the area are dolomites and limestones. The major portion of carbonate solute is gained subaerially and in the upper part of the vadose zone. Most cave and spring water is already saturated with respect to aragonite and calcite. The karst depressions are mostly associated with fault-line traces. Their evolution is possible mainly in areas sloping initially less than 15 deg. The absence of evolved caves, representing well-developed karst of an earlier period, is attributed mainly to the marginal climate throughout the past, combined with tectonic and hydrologic instability of the region. The discharge of the karst springs shows clearly dependence on annual precipitation, with a lag of about 2 years of the response to drought or more humid periods. Long-term fluctuations are larger in the smaller T'EO Spring than in the larger 'Enan Springs. Most of the denuded material is extracted from the region as dissolved load via underground conduits and only small amounts as clastics. Mean long-term denudation is approximately 20 mm per 1,000 years, averaged for the surface area contributing to the springs. Most topographic forms are shaped by runoff erosion, active during medium to high intensity rainstorms. Solution processes prevail during low to medium rainfall intensities. Even in karst depressions, erosion becomes dominant after their bottoms are covered by almost impervious terra-rossa mantle. (Knapp-USGS)
W74-07157

MINERAL SPRINGS IN THE SUEZ RIFT VALLEY--COMPARISON WITH WATERS IN THE JORDAN RIFT VALLEY AND POSTULATION OF A MARINE ORIGIN,
Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Centre.
For primary bibliographic entry see Field 2K.
W74-07167

WATER RETENTION OF GRANITIC SOILS IN THE IDAHO BATHOLITH,
Forest Service, (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W74-07170

PUBLIC GROUNDWATER SUPPLIES IN ADAMS COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4B.
W74-07172

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-07176

VERTICAL MOVEMENTS IN THE NONSATURATED ZONE AND THE SPECIFIC YIELD OF A WATER-TABLE AQUIFER (ETUDE DES TRANSFERTS VERTICAUX DANS LA ZONE NON SATUREE ET DE L'EMMAGASINEMENT D'UNE NAPPE LIBRE, DANS LE CAS D'UN POMPAGE, DANS LES CONDITIONS NATURELLES),
Bordeaux Univ. (France).
A. Cazal, and G. Lacazedieu.
Journal of Hydrology, Vol 21, No 1, p 33-59, January 1974. 15 fig, 2 tab, 12 ref.

Descriptors: *Water level fluctuations, *Aquifer testing, *Water balance, *Drawdown, *Unsaturated flow, Wetting, Surface-groundwater relationships, Withdrawal, Saturated flow, Groundwater movement, Specific yield.
Identifiers: *France.

A 1-month pumping test was carried out during the summer of 1970 to study the desaturation of the cone of depression, the restoration of the water level, and rewetting during the recovery phase. The observations were continued to evaluate the water movements during an annual cycle. Slow and long-continued drainage was due to the low permeability of the water-bearing formations. Less than half the gravitational water was removed. The specific yields obtained from nuclear methods and from other methods based on the transient flow formulae are quite different; as much as 10-15 times smaller for the transient flow methods. In the unsaturated zone the capillary fringe contributed only a small part to the water flux. In the cone of depression the resaturation was not complete. During the recharge period, water-level rose in the absence of vertical fluxes, due to an increase of the level of a nearby river. The water balance obtained from the water content measurements is close to that found by the generalized Darcy Law and it yields an acceptable approximation of infiltration and evapotranspiration components. The evapotranspiration estimated by this method is, however, very different from that derived from the climatic method. Most of the groundwater recharge is obtained by a few periods of intense precipitation during which the daily fluxes reach values 100 times higher than normal inflow. Summer rains can reach the groundwater table when their intensity and timing create conditions favorable for downward flow in the upper soil horizons. (Knapp-USGS)
W74-07182

AQUIFERS IN THE SOKOTO BASIN, NORTHWESTERN NIGERIA, WITH A DESCRIPTION OF THE GENERAL HYDROGEOLOGY OF THE REGION,
Geological Survey, Washington, D.C.
H. R. Anderson, and W. Ogilbee.
Available from GPO, Washington, D.C. 20402. Price $6.75. Water-Supply Paper 1757-L, 1973. 79 p, 10 fig, 11 plate, 12 tab, 25 ref.

Descriptors: *Water resources, *Hydrologic data, *Hydrogeology, *Groundwater, Aquifers, Aquifer characteristics, Africa, Water yield, Water quality, Water wells.
Identifiers: *Nigeria(Sokoto River basin).

Flow in streams of the Sokoto Basin of Nigeria is mostly overland runoff. Only in a few reaches are streams perennial. The sedimentary rocks of the basin range in age from Cretaceous to Tertiary and are composed mostly of interbedded sand, clay, and some limestone; the beds dip gently toward the northwest. These rocks contain three important artesian aquifers, in addition to regional unconfined groundwater bodies. The Gundumi Formation, resting on the basement complex, is composed of clay, sand, and gravel and attains a thickness of 800 to 1,000 feet. Most of the formation does not yield large quantities of water to boreholes. Aquifer tests indicate low transmissivities, ranging from 300 to 5,000 gph per ft in the lower part of the Gundumi Formation; but in the upper sandy zone the transmissivities are much higher, reaching 66,000 gpd per ft. The Rima Group contains an extensive artesian aquifer which is economically important in the Sokoto and Birnin Kebbi areas. In the basal part of the Gwandu Formation is an extensive and productive arte-

sian aquifer contained in a sandy zone a few tens to a few hundred feet thick. In the River Sokoto fadama, considerable potential exists for development of unconfined groundwater from Quaternary alluvium. With the exception of high iron content, the chemical quality of groundwater in the Sokoto Basin is suitable for most uses. Under existing economic conditions, the artesian water can best be utilized for livestock watering, for the domestic requirements of villages, and for municipal and industrial purposes. (Knapp-USGS)
W74-07184

RECORDS OF GROUND-WATER LEVELS IN WYOMING, 1940-1971,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W74-07186

WATER RESOURCES OF THE TAUNTON RIVER BASIN SOUTHEASTERN MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-07190

LONG-TERM TRENDS IN GROUNDWATER LEVEL FLUCTUATIONS (MNOGOLETNIYE TENDENTSII V KOLEBANIYAKH UROVNEY POSZEMNYKH VOD),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
V. S. Kovalevskiy, N. G. Maksimova, and T. V. Pudova.
Vodnyye Resursy, No 5, p 78-85, 1973. 3 fig, 1 tab, 11 ref.

Descriptors: *Groundwater, *Groundwater resources, *Groundwater movement, *Water level fluctuations, *United States, Observation wells, Maps.
Identifiers: *USSR.

Analysis of longest periods of record of the groundwater regime in the USSR and the United States shows long-term trends toward a rise or decline in groundwater levels characteristic of large regions. The average rate of decline in groundwater levels in observation wells of the United States during the last 30-35 years is 0.16 m/yr, and the average rate of rise in levels is 0.03 m/yr. Groundwater storage in the United States during this period was depleted at an average rate of 0.1 m/yr. During the last 10 years there has been a general depletion of groundwater storage in both the United States and the Soviet Union despite the fact that a reduction in groundwater recharge in some areas was partially compensated by an increase in groundwater recharge in others. These changes are associated with changes in climate and with the economic activities of man. During the last 10 years, groundwater storage in the United States was depleted at an average rate of about 1 cm/yr. Definite patterns of long-term changes in groundwater storage in the USSR are difficult to determine because of the uneven areal distribution of the country's observation network and the short (10-12 year) periods of record in Siberia and the Soviet Far East. Distribution of regions in the United States and the Soviet Union with a predominant long-term rise or decline in groundwater levels is mapped. (Josefson-USGS)
W74-07191

GROUND-WATER RESOURCES OF MCLEAN COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
R. L. Klausing.
North Dakota Geological Survey Bulletin 60, Part III, and North Dakota State Water Commission County Ground-Water Studies 19, Part III, 1974. 73 p, 24 fig, 3 plate, 7 tab, 45 ref, append.

Descriptors: *Groundwater, Water resources, *North Dakota, *Glacial drift, Hydrogeology, *Aquifer characteristics, Water yield, Water quality, Hydrologic data.
Identifiers: McLean County(N Dak).

Groundwater in McLean County, North Dakota, is obtainable from aquifers composed of sand and gravel in the glacial deposits and sandstone and lignite in the preglacial rocks. The aquifers with greatest potential for development are those in the glacial deposits. Most are associated with buried valleys and melt-water channels. A large interconnected system of aquifers is associated with buried valleys in east-central McLean County. The aquifers contain about 940,000 acre-feet of groundwater in available storage. Well yields of as much as 1,500 gallons per minute are possible from the Lake Nettie aquifer. Other glacial aquifers have well yields of as much as 1,500 gpm. Well yields of as much as 1,000 gpm should be obtainable from the White Shield aquifer, which occupies a former valley of the Missouri River in western McLean County. Water from the aquifers in the glacial deposits is predominantly a sodium bicarbonate or calcium bicarbonate type and is usually hard to very hard. Wells tapping the Fort Union Group of Paleocene age generally yield from 5 to 75 gpm; however, in places yields as great as 200 gpm may be possible. The water is predominantly a sodium bicarbonate type. Wells tapping the Hell Creek and Fox Hills Formations yield from 10 to 50 gpm. The water is predominantly a sodium bicarbonate type. (Knapp-USGS)
W74-07313

HYDROLOGIC CONDITIONS IN THE LAKELAND RIDGE AREA OF POLK COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4B.
W74-07318

DATA FOR MUNICIPAL WELLS IN THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-07320

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1974.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07321

SANDSTONE AQUIFERS IN EASTERN SULLIVAN COUNTY, INDIANA,
Indiana Univ., Bloomington.
For primary bibliographic entry see Field 4B.
W74-07401

PUBLIC GROUNDWATER SUPPLIES IN BOND COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4B.
W74-07429

UNDERFLOW IN RIVER VALLEYS OF THE CARPATHO-UKRAINE (PODRUSLOVYY STOK V RECHNYKH DOLINAKH ZAKARPAT'YA),
Akademiya Nauk USSR, Kiev. Instytut Geologichnykh Nauk.
B. Yu. Lyaskovskiy.
Meteorologiya i Gidrologiya, No 6, p 77-83, June 1973. 2 tab, 14 ref.

Descriptors: *Underflow, *Subsurface flow, *Groundwater movement, *Surface-groundwater relationships, *Alluvial channels, *Valleys, Mountains, Streams, Water balance, Geophysics, Hydrometry, Estimating.
Identifiers: *USSR(Carpatho-Ukraine).

Estimates of underflow in major river valleys on the southern slope of the Carpatho-Ukraine (Carpathian Ruthenia) were based on geophysical and hydrometric data. Investigations of underflow were conducted in June-August 1971 in valleys of the Uzh, Latoritsa, Borzhava, Rika, Tereblya, Teresva, Shopurka, and Tisza Rivers. The amount of groundwater discharged in the form of underflow from the southern slope of the Carpathian fold mountains in the region of the Carpatho-Ukraine Neogene Depression is approximately 20 million cu m/yr and must be taken into account in analyzing total water balance of the region. Josefson-USGS)
W74-07504

GROUND-WATER FLOW PATTERNS IN CONFINED AQUIFERS AND POLLUTION,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 5B.
W74-07510

THE INFLUENCE OF GEOLOGICAL MEMBRANES ON THE GEOCHEMISTRY OF SUBSURFACE WATERS FROM MIOCENE SEDIMENTS AT KETTLEMAN NORTH DOME IN CALIFORNIA,
California Univ., Berkeley. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2K.
W74-07513

EFFECT OF PARTIAL PENETRATION ON FLOW IN UNCONFINED AQUIFERS CONSIDERING DELAYED GRAVITY RESPONSE,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
S. P. Neuman.
Water Resources Research, Vol 10, No 2, p 303-312, April 1974. 7 fig, 28 ref.

Descriptors: *Groundwater movement, *Unsaturated flow, Water table, Water level fluctuations, Pumping, Water yield, *Storage coefficient, Specific yield, Simulation analysis.

The delayed response process characterizing flow to a well in an unconfined aquifer can be simulated by using constant values of specific storage and specific yield without recourse to unsaturated flow theory. The theory is extended to account for the effect of a well partially penetrating a homogeneous anisotropic unconfined aquifer. Field and laboratory evidence suggests that the elastic storage properties of unconfined aquifers may often be much more pronounced than those of deep-seated confined aquifers composed of similar materials. (Knapp-USGS)
W74-07514

A NUMERICAL MODEL BASED ON COUPLED ONE-DIMENSIONAL RICHARDS AND BOUSSINESQ EQUATIONS,
Stanford Univ., Calif. Dept. of Geology.
M. F. Pikul, R. L. Street, and I. Remson.
Water Resources Research, Vol 10, No 2, p 295-302, April 1974. 9 fig, 1 tab, 21 ref. NSF Grant GK-26153X.

Descriptors: *Numerical analysis, *Groundwater movement, *Soil water movement, Dupuit-Forchheimer theory, Water table, Vegetation effects, Infiltration, Simulation analysis, Mathematical models.
Identifiers: *Boussinesq theory.

An approximate numerical method to solve transient two-dimensional unsaturated-saturated subsurface flow problems uses several one-dimensional vertical unsaturated column models linked to a one-dimensional saturated flow model. The Dupuit-Forchheimer assumptions are used for the saturated flow, and the unsaturated flow is as-

sumed to be strictly vertical. The systems are linked because solutions of the equation governing unsaturated flow determine recharge and storage and this information is used to solve the equation governing saturated flow. In addition, the position of the water table locates the lower boundaries of the unsaturated models. The solution of a test problem using a linked model was compared with results from a rigorous two-dimensional model. The comparison was good at early times when recharge to the water table is small but poor at later times when recharge increases. Results compare closely with an actual groundwater hydrograph. In addition, a linked model shows that in a humid climate watershed the type of vegetation does not significantly affect the groundwater regimen, whereas in an arid climate watershed the type of vegetation would determine whether groundwater recharge occurred. For field-size problems, where water table movement is relatively small, where the Dupuit-Forchheimer assumptions are valid, and where lateral unsaturated flow is not important, the linked model offers an efficient approximate way to solve unsaturated-saturated flow problems. (Knapp-USGS)
W74-07515

MATHEMATICAL SIMULATION OF SUBSURFACE FLOW CONTRIBUTIONS TO SNOWMELT RUNOFF, REYNOLDS CREEK WATERSHED, IDAHO,
Agricultural Research Service, Boise, Idaho. Northwest Watershed Research Center.
G. R. Stephenson, and R. A. Freeze.
Water Resources Research, Vol 10, No 2, p 284-294, April 1974. 10 fig, 2 tab, 14 ref.

Descriptors: *Simulation analysis, *Subsurface runoff, *Snowmelt, Groundwater movement, Soil water movement, Base flow, Snowpacks, Mathematical models, *Idaho, Infiltration.
Identifiers: Reynolds Creek(Idaho).

A mathematical model of subsurface flow complements a field study of snowmelt runoff in a small upstream source area in the Reynolds Creek Experimental Watershed near Boise, Idaho. Field measurements from an instrumented cross section of this small watershed show that the mechanism of streamflow generation is subsurface delivery of meltwater over limited distances through shallow high-permeability low-porosity formations of altered and fractured basalt. The mathematical model provides a two-dimensional transient saturated-unsaturated analysis of the subsurface flow at the field site. It was a valuable aid to a unified interpretation of the field measurements. For mathematical models that consist of boundary value problems with boundary conditions that are time and space dependent, the boundary condition sensitivity can thwart the rational calibration-validation procedure. This, together with the more serious limitations of data availability, funds for data acquisition, and computer capacity, precludes the imminent use of fully deterministic hydrologic response models on larger basins or on a regional scale. (Knapp-USGS)
W74-07516

STEADY STATE FLOW IN RIGID NETWORKS OF FRACTURES,
Leeds, Hill and Jewett, Inc., San Francisco, Calif.
C. R. Wilson, and P. A. Witherspoon.
Water Resources Research, Vol 10, No 2, p 328-335, April 1974. 13 fig, 21 ref.

Descriptors: *Groundwater movement, *Fractures(Geologic), *Laminar flow, Saturated flow, *Finite element analysis, Numerical analysis, Permeability, Steady flow, Networks.

The finite element was used to develop two numerical methods of calculating the flow characteristics of rigid networks of planar fractures. One method uses triangular elements to investigate details of laminar flow in fractures of irregular cross section combined with that of a permeable rock matrix. The other method uses line elements and is designed only for flow in networks of planar fractures in an impermeable matrix. As an example of the application of the finite element approach, the line element method was used to develop a series of dimensionless graphs that characterize seepage in idealized fracture systems beneath dams. These methods treat two-dimensional flow in the laminar regime for networks of fractures of arbitrary orientation and aperture distribution. (Knapp-USGS)
W74-07521

A GROUNDWATER PROFILE SAMPLER,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
E. A. Hansen, and A. R. Harris.
Water Resources Research, Vol 10, No 2, p 375, April 1974. 1 fig, 1 ref.

Descriptors: *Sampling, *Groundwater, Water wells, Boreholes, Water quality.

A series of fiberglass probes spaced in sand-packed compartments in a screened well point permits the collection of a number of discrete groundwater samples from predetermined depths in a single borehole. (Knapp-USGS)
W74-07523

AN EXPERIMENTAL STUDY OF IMMISCIBLE DISPLACEMENT WITH AN UNFAVORABLE MOBILITY RATIO IN POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
S. P. Gupta, and R. A. Greenkorn.
Water Resources Research, Vol 10, No 2, p 371-374, April 1974. 3 fig, 1 tab, 16 ref.

Descriptors: *Mixing, *Porous media, *Groundwater movement, Saline water intrusion, Path of pollutants, Flow, Interfaces, Saline water-freshwater interfaces.

Viscous fingering was studied in a glass bead model covering the entire scope of finger development from incipient fingers to a parallel-sided single finger in both miscible and immiscible displacement. As incipient fingers move, they decrease in number. Both decay and merging are simple viscous effects. The rate of growth develops almost immediately, well before the finger is parallel sided. The mechanisms of wavelength generation and degeneration are discussed on physical grounds. (Knapp-USGS)
W74-07524

2G. Water In Soils

BROAD SPECTRUM MICROWAVE SYSTEMS FOR REMOTELY MEASURING SOIL MOISTURE CONTENT,
Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
W. P. Waite, K. R. Cook, and B. B. Bryan.
Available from the National Technical Information Service as PB-231 558, $4.75 in paper copy, $1.45 in microfiche. Arkansas Water Resources Center, Fayetteville, Publication No. 18, November 1973. 166 p, 67 fig, 2 tab, 21 ref. OWRR B-020-ARK(1). 18-31-0001-3557.

Descriptors: *Remote sensing, *Soil moisture, *Microwaves, *Radar, Temperature, Reflectance, Measurement, Soil surfaces, Instrumentation, Surfaces, Algorithms, Electromagnetic waves.
Identifiers: *Radiometric temperature, *Dielectric constant, *Rough surface distortion, Smooth surfaces.

A theoretical and experimental study of the microwave reflectivity of soils with varying moisture content was conducted. A system was developed to measure reflectivity over a continuous frequency range of 4 to 26.5 GHz, at incidence angles from 10 to 70 deg, and with both horizontal and vertical polarization. The measurements were found to be extremely accurate for smooth homogeneous surfaces; however, the effects of surface roughness were more severe than predicted due to the discontinuous nature of naturally occurring rough surfaces. An algorithm was developed which used the frequency dependence of the reflectivity to estimate the effective roughness of the surface and permit correction to an equivalent smooth surface reflectivity which in turn could be related to dielectric constant or percent moisture content. For the frequency range of investigation the maximum mean square height deviation that could be accommodated was approximately one inch. From this it may be concluded that operational airborne or spacecraft sensors must operate in the 500 MHz to 1 GHz range. Even at this reduced frequency it will be impossible to neglect the effects of roughness and a diversity technique such as developed here is essential if an absolute measure of soil moisture is to be made.
W74-07052

SUBSURFACE HEATING AND IRRIGATION OF SOILS: ITS EFFECT ON TEMPERATURE AND WATER CONTENT AND ON PLANT GROWTH,
Oregon State Univ., Corvallis. Dept. of Soil Science.
E. W. R. Barlow, A. R. Sepaskhah, and L. Boersma.
Available from the National Technical Information Service as PB-231 555, $4.50 in paper copy, $1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report WRRI-23, March 1974. 109 p, 39 fig, 27 tab, 108 ref. OWRR B-028-ORE(5).

Descriptors: *Soil temperature, Heating, *Soil treatment, Subsurface irrigation, Plant physiology, *Corn(Field), Crop production, *Heat treatment, *Plant growth.
Identifiers: *Soil heat.

Subsurface irrigation even without heating the soil has given good results in terms of increased yields of crops and decreased water requirements in comparison with other methods of water application. Laboratory experiments were used to study the effect of heat source temperature on the temperature distribution around a line heat source in different soils. Different soil surface heat loads were applied to study the effect of varying climatic conditions on the temperature distributions. Effects of heat source temperature, soil surface temperature, and soil texture on rate of heat dissipation were studied. Water was applied near the heat source to determine the rate of water application required to maintain a constant soil water content at different heat source temperatures. Water content distributions and rates of water application were measured. Concurrent experiments were conducted to determine the effect of lowering root temperature on plant growth by measuring the effects on plant water potential and its relation to leaf elongation, photosynthesis, and transpiration, using young corn plants.
W74-07054

EXPERIMENTAL EVALUATION OF A METHOD FOR DETERMINING UNSATURATED HYDRAULIC CONDUCTIVITY,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs, E. J. Monke, and L. F. Huggins.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 1, p 85-88, 1973. 9 fig, 17 ref. OWRR A-021-IND (3).

Descriptors: *Hydraulic conductivity, *Infiltration, *Unsaturated flow, Porous media, Soil water content.
Identifiers: Gamma ray attenuation.

An approximate method for determining unsaturated hydraulic conductivity was based on the assumption that the conductivity-pressure head relationship could be effectively represented by an empirical 3-parameter equation by Gardner. The conductivity functions of two artificially packed soils were determined. Infiltration rate-time relationships were then measured for infiltration into soil columns having different initial water content distribution. These relationships were compared to influx curves predicted through the use of the determined K (h) functions, that is, the hydraulic conductivity-pressure head relationship. The K (h) functions obtained for the two soils experimentally investigated gave reliable predictions of the influx curves for different initial water content distribution. Further evidence of the validity of the K (h) functions was given by the close agreement between the predicted and measured wetting front movement for tests on dry soils. (Wiersma-Purdue)
W74-07088

REACTIVATING SOIL RIPPING TREATMENTS FOR RUNOFF AND EROSION CONTROL IN THE SOUTHWESTERN U.S.,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
E. F. Aldon.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 154-160, Sept. and Dec. 1972. 1 fig, 2 tab, 4 ref.

Descriptors: *Deep tillage, *Erosion control, *Soil treatment, *Soil management, Runoff, Percolation, Soil moisture, Moisture availability, Evapotranspiration, Precipitation(Atmospheric), Infiltration, Induced infiltration, Retention, Soil water, Storage capacity, Water storage, Soil-water-plant relationships, *Southwest U.S.
Identifiers: *Soil ripping.

The process of breaking up soil for increased moisture penetration is called soil ripping. It is an effective method for controlling erosion and runoff for 3 to 5 years in the southwestern United States. The re-ripping of soils which have been closed after an initial soil ripping treatment is an economical method of reducing runoff to two thirds the undisturbed level. This was as effective as ripping new areas and did not destroy the vegetation of the originally undisturbed area. Thus vegetation may be established in areas for long-term runoff control while interspersed areas are repeatedly ripped for immediate control. Indiscriminant ripping can encourage soil piping, so care must be taken when ripping shallow shale soils. (Muller-Arizona)
W74-07089

EFFECT OF CONTOUR FURROWS AND CONTOUR BUNDS ON WATER CONSERVATION IN GRASSLANDS OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07090

EFFECT OF GYPSUM IN REDUCING BORON HAZARD OF SALINE WATERS AND SOILS,
Central Soil Salinity Research Inst., Karnal (India).
For primary bibliographic entry see Field 3C.
W74-07095

MINERALOGICAL COMPOSITION OF CLAYS IN SOIL PROFILES OF ISRAEL: I. THE SOILS OF THE MEDITERRANEAN ZONE,
Hebrew Univ., Rehovot (Israel). Dept. of Soil and Water Science.
M. Gal, S. Ravikovitch, and A. J. Amiel.
Hebrew University of Jerusalem, Faculty of Agriculture, Rehovot, Israel. October 1972. p 1-18. 6 fig, 2 tab, 31 ref.

Descriptors: *Clay minerals, *Soil profiles, *Montmorillonite, Cation exchange, Soil analysis, Bedrock, Aeolian soils, Calcite, Soil types, Alluvium.
Identifiers: *Israel, *Mediterranean zone.

Soil formation of the Mediterranean zone of Israel takes place under the influence of alternate wetting (short rainy winter) -- drying (long dry hot summer) cycles. Soil samples were taken from upland arid valley sites, and are grouped first by origin: the soils formed of bedrock, and those developed from alluvial and aeolian sediments from parent rocks outside the area of distribution of the soils. Soils in these groups are subdivided by the minerals found in their clays. Montmorillonite is the dominant mineral in the clay fraction of two soil groups. The third group contains an appreciable amount of calcite in its clay. Cation exchange capacity is highest in the group of soils where montmorillonite accounts for more than two thirds of the minerals. (See also W74-07100) (Ferreira-Arizona)
W74-07099

MINERALOGICAL COMPOSITION OF CLAYS IN SOIL PROFILES OF ISRAEL: II. THE SOILS OF THE DESERT ZONE,
Hebrew Univ., Rehovot (Israel). Dept. of Soil and Water Science.
S. Ravikovitch, M. Gal, and V. Cossman.
Hebrew University of Jerusalem, Faculty of Agriculture, Rehovot, Israel. October 1972. p 19-31. 4 fig, 2 tab, 12 ref.

Descriptors: *Soil analysis, *Soil profiles, *Montmorillonite, *Clay minerals, Illite, Kaolinite, Deserts, Cation exchange, Calcite, Aeolian soils, Bedrock, Gravels, Soil types.
Identifiers: *Israel.

From samples taken from areas with 200-300 mm annual precipitation, the soils of Israel's desert steppe regions were classified into three groups on the basis of the mineral composition of the clay fraction. The first group contains montmorillonite as the dominant mineral, with kaolinite and illite as main accessory minerals. Group 2 soils contain montmorillonite as the dominant mineral in the clay fraction, with calcite as the main accessory. Group 3 soils contain montmorillonite as the dominant mineral, accounting for between one-third and one-half of all the clay. The main accessory minerals are kaolinite and calcite. Soils of the third group are very common in the desert region. Cation exchange capacity of the clays ranges widely in desert soil. Soils formed from desert aeolian dust and alluvial sediments are compared with soils formed from bedrock and stony alluvium. (See also W74-07099) (Ferreira-Arizona)
W74-07100

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: I. OBSERVATIONS DURING FLOODING AND DRYING,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. R. Grass, A. J. MacKenzie, B. D. Meek, and W. F. Spencer.
Soil Sci Soc Am Proc. Vol 37, No 1, p 14-17. 1973, Illus.
Identifiers: Carbon, Clogging, Drying, Flooding, *Iron, Irrigation, *Manganese, Nitrates, Nitrogen, Redox, Salinity, Saturation, Soils, *Solubility, *Tile(Drains), Waterlogging, *California(Imperial Valley).

A field study of waterlogging and subsequent drying of the soil profile showed that under irrigation culture in Imperial Valley (California) reducing conditions became prevalent. Reducing conditions, as indicated by declining Eh (redox potential) values, became most favorable for dissolution of Mn and Fe near the soil surface. However, the concentrations of Mn2+ and Fe2+ were lowest near the surface, probably because of their leaching from this zone, and the shorter time of contact between soil solution and soil particles. The concentrations of Fe2+ and Mn2+ were higher in the deeper horizons of the soil profile. In the plow layer, the reducing intensity increased, beginning 9 m away from the tile and reaching a maximum 18-23 m from the tile drain. The Eh levels in the soil profile declined immediately after irrigation began and rose immediately after irrigation stopped indicating the importance of atmospheric O2 to the oxidation-reduction status and, therefore, to the solubility of Fe and Mn compounds. Soluble organic C apparently was not related to the concentration of Mn2+ or Fe2 in the soil solution even though the decomposition of soil organic matter is important in oxidation-reduction reactions in the soil profile. (See also W74-07152), Copyright 1973, Biological Abstracts, Inc.
W74-07151

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: II. OBSERVATIONS DURING THE GROWTH OF COTTON,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. B. Grass, A. J. MacKenzie, B. D. Meek, and W. F. Spencer.
Soil Sci Soc Am Proc. Vol 37, No 1, p 17-21, 1973, Illus.
Identifiers: Carbon, Clogging, Cotton, Drain clogs, Gossypium-Hirsutum, Growth, *Iron, Irrigation, *Manganese, Nitrates, Nitrogen, Redox, Salinity, Saturation, Soil, *Solubility, *Tile drains, Waterlogging, *California(Imperial Valley).

Various levels of oxidation-reduction develop in the soil profile during the irrigation and growing season of the cotton (Gossypium hirsutum L.) crop. Reducing intensity increased with depth during the growing season and reached maximum intensity at the 6.10-m depth. Reducing conditions favorable to increased solubility of Fe and Mn were observed in the surface horizons of the profile during most of the season. Changes in the solubility of Mn and Fe occurred with changes in the oxidation-reduction status in the soil profile. Mn began to dissolve at 400 m V and became significant at less than 300 m V. Increased concentration of nitrate retarded reduction of oxidized Fe and Mn compounds. The salinity of the soil solution affected the concentration of soluble Mn and Fe. The presence of NO3--N in the soil solution in amounts > 0.2 ppm retarded the dissolution of Mn compounds. The solubility of Mn and Fe can probably be controlled by controlling or regulating the oxidation-reduction status of the soil profile by reducing the waterlogging period after irrigation to a minimum. (See also W74-0715), Copyright 1973, Biological Abstracts, Inc.
W74-07152

INTENSIVE INFILTROMETER STUDIES ON A PLOWED BIG SAGEBRUSH SITE,
Utah State Univ., Logan. Watershed Science Unit.
G. F. Gifford, and F. E. Busby.
Journal of Hydrology, Vol 21, No 1, p 81-90, January 1974. 3 fig, 5 tab, 3 ref.

Descriptors: *Infiltration, *Infiltrometers, *Idaho, *Grazing, Rainfall-runoff relationships, Sagebrush, *Range management, Evapotranspiration, Vegetation effects.
Identifiers: *Plowing.

Intensive infiltrometer studies were made over a 4-year period on a plowed big sagebrush (Artemisia tridentata) site in southern Idaho. There was a natural decay in absorptive capabilities of surface soils due to the plowing treatment. The apparent result of grazing was to eliminate seasonal trends so that infiltration rates were low throughout the year. Grazing did not increase sediment production potentials beyond the increases expected as a result of mechanical disturbance associated with

plowing. Easily measured soil cover characteristics do not adequately reflect the potential hydrologic performance of a big sagebrush site which has been grossly modified by activity such as plowing or grazing. (Knapp-USGS)
W74-07166

NUMERICAL STUDIES OF TWO-DIMENSIONAL SATURATED-UNSATURATED DRAINAGE MODELS,
Oslo Univ. (Norway). Inst. of Geophysics.
M. Todsen.
Journal of Hydrology, Vol 20, No 4, p 311-326, December 1973. 10 fig, 15 ref.

Descriptors: *Soil water movement, *Saturated flow, Drainage, *Numerical analysis, Mathematical models, *Seepage, Moisture tension, Specific retention.

The partial differential equation which governs the seepage of water in unsaturated and saturated porous media was solved numerically by a generalized Newton iteration technique for two models, one of ditch drainage and one of an earth dam model. For both two-dimensional models, a few hypothetical soils with different moisture retention curves were considered. In both models only drainage from an initially saturated soil occurs; thus, the problem of hysteresis is avoided. The results of the computations were compared with those of corresponding saturated (pure groundwater) models. Computational instability phenomena appear when the slope of the retention curves is made steep, (for poorly-graded soils). (Knapp-USGS)
W74-07168

EVAPORATION OF WATER FROM SAND: 5. THE EFFECT OF EVAPORATION ON THE CONCENTRATION OF SALTS DISSOLVED IN WATER STORED IN SAND,
National Inst. for Water Research, Windhoek (South-West Africa).
For primary bibliographic entry see Field 2D.
W74-07169

WATER RETENTION OF GRANITIC SOILS IN THE IDAHO BATHOLITH,
Forest Service, (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
J. L. Clayton, and C. E. Jensen.
USDA Forest Service Research Paper INT-143, December 1973. 20 p, 8 fig, 6 tab, 17 ref, append.

Descriptors: *Soil moisture, *Moisture tension, *Organic matter, Moisture content, Soil texture, Forest soils, Soil-water-plant relationships, Clays, Particle size, Mathematical models, Forestry, Granites, Idaho.
Identifiers: *Moisture retention, *Idaho Batholith.

Volumetric soil-water retention was evaluated at 1/3 and 15 bars for its relation to the effects of organic matter, fines (<50 micrometer diameter) and soil bulk density. Samples were from soils formed from granitic parent materials of the Idaho Batholith. These soils are coarse-textured and have a broad range of organic matter content. Texture has only a secondary effect in the Batholith soils. In contrast, retention is strongly affected by organic matter, because of the broad organic matter range and the enhanced potential for organic matter to exert its retention effects. Organic matter alone explains 57% of the variance in water retention at 1/3 bar, and 62% at 15 bars tension. Incorporating the interacting effects of the remaining two variables explains an additional 17% of the variance in water retention at 1/3 bar, and an additional 11% at 15 bars. Tables and equations for the two retention models are presented. The final models were subsequently adjusted by least squares to two data sets of geographically diverse soils from the Idaho Batholith. The adjusted retention models operate well for predicting water retention at both energy levels. (Knapp-USGS)
W74-07170

ACTIVITY OF THE MICROORGANISMS AND THE MINERALIZATION OF THE ORGANIC MATTER PEAT SOILS WITH A VARYING LEVEL OF SUB SOIL WATERS, (IN RUSSIAN),
T. G. Zimenko.
Izv Akad Nauk SSSR Ser Biol. 6, p 846-854. Illus. 1972. English summary.
Identifiers: Amino acids, Enzymes, Microbial studies, *Microorganisms, *Mineralization, *Organic matter, *Peat soils, Respiration, Soils, Subsoil waters.

The group composition and activity of the microorganisms in peat soils depends on the level of subsoil waters. At a depth equal to 58-60 cm, unfavorable conditions of a hydroair regime are created in the soil leading to a suppression of the development of the microorganisms. Lowering of subsoil waters is followed by a progressive increase of the number and activity of microorganisms. This is immediately followed by an activation of the processes of soil respiration, accumulation of free amino acids and enzyme formation. The biological mineralization of peat is enhanced. The contents of the general organic matter, N and C are reduced.--Copyright 1973, Biological Abstracts, Inc.
W74-07230

RESEARCH ON THE MICROMORPHOLOGY OF THE FLOODED POSZOLIC SOILS OF SHALLOW WATER RESERVOIRS, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Melioration.
V. G. Vinogradov.
Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 5, p 83-87. 1972. Illus. (English Summary).
Identifiers: *Flooding, *Micromorphology, Oxygen, *Podzolic soils, Podzols, Redox, Reservoirs, Soils, Saturated soils.

Under conditions of prolonged flooding (over 30 yr) of podzolic soils with water saturated with O2 (having a high level of Eh (redox potential) and pH) the morphology practically did not change. The process of their transformation occurred under specific conditions quite different from swamping.--Copyright (c) 1973, Biological Abstracts, Inc.
W74-07235

EFFECT OF IRRIGATION ON DYNAMICS OF MICROORGANISM QUANTITY IN DARK-BROWN SOILS IN SOUTHERN UKRAINE, (IN UKRAINIAN),
Akademiya Nauk URSR, Kiev. Inst. of Microbiology and Virology.
V. T. Smalii, O. M. Dul'herov, L. I. Sira, and V. K. Dovzhenko.
Microbiol Zh (KYYIV). Vol 34, No 5, p 566-570. 1972 (English summary).
Identifiers: Actinomycetes, *Bacteria, *Fungi, *Irrigation, Microorganisms, *Soils(Dark brown), *USSR(Ukraine), Soil moisture.

During irrigation a number of fungi and bacteria increase considerably. Actinomycetes were not affected by an increase in soil moisture. The optimal conditions for intensive reproduction of bacteria and fungi with irrigation at 70% of maximum field moisture capacity are described.--Copyright 1973, Biological Abstracts, Inc.
W74-07279

INFILTRATION AND WATER TABLE EFFECTS OF SOIL AIR PRESSURE UNDER BORDER IRRIGATION,
Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 3F.
W74-07301

APPLICATION OF THE SPLINE FUNCTION TO SOIL SCIENCE,
California Univ., Davis.
K. T. Erh.
Soil Sci. Vol 114, No 5, p 333-338, 1972. Illus.
Identifiers: Diffusivity, Infiltration, Pressure, *Soil water, *Spline function, *Soil profiles, *Water storage, Hydraulic conductivity.

The most attractive feature of the spline function approximation method is its capability of transferring an empirical and phenomenological relationship into a definite mathematical formula. It is not a statistical method and bears no statistical significance. Spline function approximation has been tested extensively for its validity and results obtained were satisfactory. Examples are presented in which the spline function approximation can be applied. Post-infiltration water pressure profiles were measured in the field. By applying the spline function approximation, the soil-water pressure and water-content profile were treated as a continuous and differentiable function of depth. Thus, the water storage capacity, the hydraulic gradient and the soil-water flux in any time interval at any depth was readily evaluated. The unsaturated hydraulic conductivity values as well as those of the soil water diffusivity were easily estimated. The use of this approximation greatly simplifies attempts to solve a partial differential equation for nonlinear adsorption isotherm by numberical methods. An example is given for soil-water profiles for 2 periods of water infiltration into air-dry Sacramento clay. For estimating the soil-water diffusivity, the application of the spline function to describe the soil-moisture profile would remove any uncertainty in determining the slope. This approximation method is a logical and reasonable approach for those situations in which a statistical technique is not applicable. --Copyright 1973, Biological Abstracts, Inc.
W74-07344

PHOSPHORUS SUPPLY CHARACTERISTICS OF ACID ORGANIC SOILS AS MEASURED BY DESORPTION AND MINERALIZATION,
North Carolina State Univ., Raleigh.
Z. W. Daughtrey, J. W. Gilliam, and E. J. Kamprath.
Soil Sci. Vol 115, No 1, p 18-24, 1973. Illus.
Identifiers: Acid *Desorption, Fertilization, Measurement, *Mineralization, Nutrition, *Phosphorus, *Soils(Acid organic), *North Carolina(Tidewater region).

Sixteen soils ranging from poorly drained mineral soils high in organic matter in surface horizons to deep colloidal mucks were collected in the Tidewater region of North Carolina. Crops on the selected soils had previously shown a varied response to applied P. P was desorbed from the soils by 12 successive equilibrations with water. Mineralization of organic P during incubation was also measured. The soils were placed into 3 categories based on the desorption patterns and amount of P released during desorption. One group, composed of the poorly drained mineral soils, exhibited an increase in P desorbed with each successive extraction but the total amount desorbed was low. This group also had a relatively small amount of P mineralized. The second group, composed of muck soils and 2 intergrade soils, exhibited a decreasing amount of P released with successive equilibrations but the total amount of P released was large. The third group of soils, composed of reed bed and intergrade soils, had either an increasing amount of P released with successive extraction and a relatively high amount of P desorbed or a very high amount of P desorbed such that the pattern of release was insignificant. Most of the soils in the third group also had large amounts of organic P mineralized during incubation. The soils of the first group were relatively infertile with respect to P supply. The soils in the second group might supply adequate P initially, but could not continue to supply sufficient P and crops grown on these soils would probably

respond to P fertilization. Soils in the third group should supply adequate P for plant growth throughout the growing season. --Copyright 1973, Biological Abstracts, Inc.
W74-07345

THE HEAT FLUX DENSITY IN A NON-HOMOGENEOUS BARE LOESSIAL SOIL,
Israel Meteorological Service, Bet-Dagan. Div. of Agricultural Meteorology.
M. Fuchs, and A. Hadas.
Boundary-Layer Meterol. Vol 3, No 2, p 191-200, 1972. Illus.
Identifiers: Density, Diurnal, Energy exchange, *Heat flux, *Loessial soil, *Soil thermal properties.

The relationship between the diurnal patterns of the radiant energy exchange in the atmospheric surface layer and the soil heat flux density of a bare irrigated soil in an arid environment is described. The soil heat flux density is a large fraction of the net radiation. The soil moisture content has little effect on this fraction but modified the phase relationship between the net radiation and the soil heat flux density waves. Differences between the thermal regimes of the 'wet' and 'dry' soil appear to be caused by latent heat exchanges rather that changes of the soil thermal properties. The variation with depth of the soil thermal properties strongly influences the propagation of the temperature and heat flux density waves in the soil. A heat diffusion theory for non-homogeneous conductors(Lettau) which enables the thermal properties of the soil to be predicted is tested by comparison with experimental determinations in the field. --Copyright 1973, Biological Abstracts, Inc.
W74-07346

STRUCTURAL CHANGES IN TROPICAL SOILS DUE TO ANIONS IN IRRIGATION WATER,
Hawaii Univ., Honolulu.
S. A. El-Swaify.
Soil Sci. Vol 115, No 1, p 64-72, 1973. Illus.
Identifiers: *Anions, Bicarbonates, Cations, Chlorides, Hydraulic conductivity, *Irrigation water, Silicates, Soils, Sulfates, *Tropical soils, Hydrogen ion concentration.

The effects of chlorides, sulfates, bicarbonates, and silicates on the hydraulic conductivities of some tropical soils were investigated. The soils, an Oxisol, and Aridisol, an Inceptisol and a Vertisol, were selected so that a wide variety of mineralogical components would be represented. The soils also represent a range of charge dependence on pH and on the presence of specifically adsorbed ions. In their natural states, they exhibit from predominantly net negative (Vertisol) to net positive (Inceptisol) charges. Anion effects became increasingly important as the proportion of amorphous materials increased, as in the Inceptisol. Such effects were due primarily to the anio's ability to change the charge characteristics of the soil, either directly or indirectly, by changing the pH of the system; and secondarily, to their effects on cation activities. When the proportion of 2:1 clays increased, cation activity changes, reflected by changes in electrolyte concentration, produced more significant structural changes than did change in anion type. This was true in the Vertisol whose charges are but little dependent on the composition of soil solution. Structural changes in the Oxisol and Aridisol, both made up of kaolins and iron oxides, depended to varying degrees on both anion type and electrolyte concentration, the first being relatively more significant in lower horizons and the second in upper horizons. --Copyright 1973, Biological Abstracts, Inc.
W74-07348

LAND DISPOSAL OF WASTE GASES: III. SORPTION PATTERNS FROM BURIED GAS INJECTION PIPES,
Arizona Agricultural Experiment Station, Phoenix.
For primary bibliographic entry see Field 5B.
W74-07422

RELATIVE MOVEMENT OF BROMIDE AND NITRATE THROUGH SOILS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
For primary bibliographic entry see Field 5B.
W74-07423

VOLATILITY OF DDT RESIDUES IN SOIL AS AFFECTED BY FLOODING AND ORGANIC MATTER APPLICATIONS,
Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 5B.
W74-07424

EFFECTIVENESS OF TWO NITRIFICATION INHIBITORS FOR ANHYDROUS AMMONIA UNDER IRRIGATED AND DRYLAND CONDITIONS,
Agricultural Research Service, Pullman, Wash. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 5G.
W74-07436

DEVELOPMENT OF AN AGRICULTURAL DRAINAGE GUIDE,
Soil Conservation Service, Berkeley, Calif.
For primary bibliographic entry see Field 4A.
W74-07438

MICRO-DETERMINATION OF CATION-EXCHANGE CAPACITY BY NEUTRON ACTIVATION ANALYSIS,
Oregon Agricultural Experiment Station, Corvallis.
M. J. Dudas.
Soil Science Society of America Proceedings, Vol 37, No 5, p 804-805, September-October, 1973. 1 fig, 2 tab, 4 ref.

Descriptors: *Cation exchange, *Gamma rays, *Clays, Kaolinite, Montmorillonite, *Neutron activation analysis.

Neutron activation analysis was evaluated as a method to determine the cation-exchange capacity (CEC) of clay samples. Cation-exchange capacity values of satisfactory reproducibility and accuracy were obtained on 5- to 50-mg subsamples of a kaolinite and montmorillonite clays previously saturated with Na, Rb, or Cs. Use of Cs as the index ion provided the simplest and most flexible conditions for the activation analysis method. (Skogerboe-Colorado State)
W74-07439

DETERMINATION OF NITRATES IN SOIL EXTRACTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
C. G. Kowalenko, and L. E. Lowe.
Soil Science Society of American Proceedings, Vol 37, No 4, p 660, July-August, 1973. 7 ref.

Descriptors: *Water chemistry, *Nitrates, Soil chemistry, Ions, Pollutant identification.

A variation of a method for nitrate analysis of water samples developed by West and Ramachandran (1966) is presented. The method can be used on soil samples in place of the phenoldisulfonic acid method with very comparable results. (Skogerboe-Colorado State)
W74-07443

NITRATE CONCENTRATIONS IN THE UNSATURATED ZONE BENEATH IRRIGATED FIELDS IN SOUTHERN CALIFORNIA,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W74-07445

EFFECTS OF SUBSURFACE ASPHALT LAYERS ON CORN AND TOMATO ROOT SYSTEMS,
Florida Univ., Gainesville. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W74-07447

PLANT AND IRRIGATION WATER REQUIREMENTS,
For primary bibliographic entry see Field 3F.
W74-07452

EFFECT OF IRRIGATION WITH THERMAL WATER ON TRACE-ELEMENT CONTENT IN SOME SOILS OF GEORGIA (VLIYANIYE OROSHENIYA TERMAL'NYMI VODAMI NA SODERZHANIYE MIKROELEMENTOV V NEKOTORYKH POCHVAKH GRUZII),
For primary bibliographic entry see Field 3F.
W74-07508

SOIL MOISTURE DYNAMICS AND ITS VARIATIONS IN SOILS UNDER FIELD CROPS (DINAMIKA VLAZHNOSTI I STEPEN' YEYE VAR'IROVANIYA V POCHVAKH POD POLEVYMI KUL'TURAMI),
Kostromskoi Selskokhozyaystvennyi Institut (USSR).
Ye. G. Kabalin, and I. K. Bodrov.
Pochvovedeniye, No 4, p 59-64, April 1973. 5 tab, 2 ref.

Descriptors: *Soil physics, *Soil water movement, *Soil moisture, *Variability, *Field crops, Potatoes, Barley, Grasses, Statistical methods, Probability.
Identifiers: *USSR, Peas.

Variations in soil moisture of the O-30-cm layer caused by crops were studied in a test plot of the Kostroma Agricultural Institute 'Karavayevo' in 1963-66. Reliable differences in soil moisture contents under potatoes, peas, and barley were determined by statistical analysis. Necessary replication of soil moisture determinations was calculated to ensure an accuracy within 10% of the determined value for different fiducial probabilities (0.80, 0.90, and 0.95). Field crops were found to have a significant effect on soil moisture content and its variations. Differences in soil moisture content at depths of 0-10, 10-20, and 20-30 cm were greater under potatoes than under peas and barley. The degree of variation and the determination error in soil moisture content increased as the soil dried and reached maximum values under peas, barley, and perennial grasses. An 8-fold replication of soil sampling at depths of 0-10 and 10-20 cm ensured an average determination accuracy within 3.1-7.2%, and a 4-fold replication at a depth of 20-30 cm, an accuracy within 6.2-7.0%. In most cases an 8-fold replication of soil moisture determinations at depths of 0-10 and 10-20 cm under all crops ensured an accuracy within 10% of the determined value for a fiducial probability of 0.90 and 0.95. A 4-fold replication of soil moisture determinations at a depth of 20-30 cm made it possible to obtain an accuracy within 10% of the determined value for a fiducial probability of 0.80. (Josefson-USGS)
W74-07509

FLUX-GRADIENT RELATIONSHIPS AND SOIL-WATER DIFFUSIVITY FROM CURVES OF WATER CONTENT VERSUS TIME,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.

D. L. Nofziger, L. R. Ahuja, and D. Swartzendruber.
Soil Science Society of America Proceedings, Vol 38, No 1, p 17-23, January-February 1974. 6 fig, 11 ref. OWRR B-014-IND(6).

Descriptors: *Soil water movement, *Unsaturated flow, Seepage, Percolation, Equations, Wetting, *Diffusivity, Diffusion.

Direct analysis of a family of curves of soil-water content versus time at different fixed positions enables assessment of the flux-gradient relationship prior to the calculation of soil-water diffusivity. The method was evaluated on both smooth and random-error data generated from the solution of the horizontal soil-water intake problem with a known diffusivity function. Interpolation, differentiation, and integration were carried out by least-squares curve fitting based on the two recently developed techniques of parabolic splines and sliding parabolas. Results were excellent for both smooth and random-error input data, whether in terms of recovering the original known diffusivity function, assessing the nature of the flux-gradient relationship, or in making the numerous checks and validations at various intermediate stages of computation. The method applies for any horizontal soil-wetting process independently of the specific boundary conditions, including water entry through a nonzero inlet resistance. It should be adaptable to horizontal dewatering, and extendable to vertical flow. (Knapp-USGS)
W74-07512

A NUMERICAL MODEL BASED ON COUPLED ONE-DIMENSIONAL RICHARDS AND BOUSSINESQ EQUATIONS,
Stanford Univ., Calif. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W74-07515

SEEPAGE THROUGH A HILLSIDE: THE STEADY WATER TABLE,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
A. W. Warrick, and D. O. Lomen.
Water Resources Research, Vol 10, No 2, p 279-283, April 1974. 3 fig, 1 tab, 12 ref.

Descriptors: *Seepage, *Groundwater movement, *Water table, Mathematical studies, Slopes, Topography, Hydraulic conductivity.

An analytical solution is given for seepage through a hillside in which a curved water table is maintained by steady percolating water. The two-dimensional surface is assumed to be a straight slope from the base to a seepage point but may be irregular at higher elevations. Conformal transformations determine seepage elevations and water table profiles as a function of the seepage rate and the slope. For small slopes and small percolation rates the seepage elevation is equal to the rainfall rate times the width of the slope divided by the saturated hydraulic conductivity. (Knapp-USGS)
W74-07517

SALT DISPLACEMENT INTO DRAIN TILES UNDER PONDED LEACHING,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
S. Miyamoto, and A. W. Warrick.
Water Resources Research, Vol 10, No 2, p 275-278, April 1974. 6 fig, 1 tab, 7 ref.

Descriptors: *Leaching, *Soil water movement, *Tile drainage, Infiltration, Mathematical models, Saturated flow, Saline water, Path of pollutants.

Steady state piston-type displacement into drain tiles when the ground surface is partially covered by an impermeable material or by ponded water away from the drains was analyzed mathematically. By preventing the water from infiltrating directly over the drains a more uniform leaching pattern is attained. The result is to reduce the water required for leaching to the depth of drains by as much as one half. Experimental data obtained from sand tank models support this prediction. (Knapp-USGS)
W74-07518

INVESTIGATION OF THE RELATION OF GROUNDWATER EVAPORATION TO LITHOLOGICAL STRUCTURE OF THE ZONE OF AERATION (K IZUCHENIYU ZAVISIMOSTI ISPARENIYA GRUNTOVYKH VOD OT LITOLOGICHESKOGO STROYENIYA ZONY AERATSII),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 2D.
W74-07529

DISTRIBUTION AND CHEMISTRY OF PHOSPHORUS IN AN ALBAQUALF SOIL AFTER 82 YEARS OF PHOSPHATE FERTILIZATION,
Missouri Agricultural Experiment Station, Columbia.
For primary bibliographic entry see Field 5B.
W74-07532

MULTIPLE ORGANOCHLORINE PESTICIDE RESIDUES IN JAPAN,
Kitakyushu Municipal Inst. of Public Health (Japan).
For primary bibliographic entry see Field 5A.
W74-07560

ACETYLENE REDUCTION BY BEIJERINCKIA UNDER VARIOUS PARTIAL PRESSURES OF OXYGEN AND ACETYLENE,
Ibadan Univ. (Nigeria). Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W74-07572

ACID AMMONIUM ACETATE EXTRACTION AND ELECTRON CAPTURE GAS CHROMATOGRAPHIC DETERMINATION OF CARBOFURAN IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5A.
W74-07574

RESIDUES OF ATRAZINE, CYANAZINE, AND THEIR PHYTOTOXIC METABOLITES IN A CLAY LOAM SOIL,
Ontario Ministry of Agriculture and Food, Guelph. Pesticides Residue Lab.
For primary bibliographic entry see Field 5A.
W74-07585

POTENTIAL OF WESTLAND'S MORAINIC SOILS FOR FOREST MANAGEMENT,
New Zealand Forest Service, Hokitika.
For primary bibliographic entry see Field 4A.
W74-07594

2H. Lakes

DISTRIBUTION AND STANDING CROPS OF CHIRONOMID-LARVAE IN SHIOZU BAY OF LAKE BIWA (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W74-07101

THE INTERLAKE AFFAIR,
Businessmen for the Public Interest, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-07120

FACTORS AFFECTING PHYTOPLANKTON PRODUCTION IN A EUTROPHIC RESERVOIR,
Naval Academy, Annapolis, Md. Div. of Mathematics and Science.
For primary bibliographic entry see Field 5C.
W74-07121

COMPONENTS OF THE WATER BALANCE OF THE ARAL SEA AND THEIR EFFECT ON ITS LONG-TERM LEVEL FLUCTUATIONS (SOSTAVLYAYUSHCHIYE VODNOGO BALANSA ARAL'SKOGO MORYA I IKH VLIYANIYE NA MMNOGOLETNIYE KOLEBANIYA YEGO UROVNYA),
All-Union Designing, Surveying and Scientific Research Inst. Hydroproject, Leningrad (USSR).
A. Ye. Asarin.
Vodnyye Resursy, No 5, p 29-40, 1973. 6 tab, 23 ref.

Descriptors: *Lakes, *Water level fluctuations, *Water balance, Inflow, Evaporation, Runoff, Water loss, Water utilization, Withdrawal, Irrigation, Deltas.
Identifiers: *USSR(Aral Sea).

Water balance of the Aral Sea was investigated for a 45-year period (1926-70). Long-term fluctuations in sea level reflect both natural fluctuations in the discharge of its contributing rivers and, to an ever-increasing degree, economic activity in the basin. An increase in water withdrawals for irrigation in the sea basin in the 1950's had no effect on the level of the sea in view of the increased water discharges during this period. An intense decline in the Aral Sea level, which began in 1961 and continues to the present day, is due primarily to larger water withdrawals in the Syrdar'ya and Amudar'ya basins. The level of the sea and the range of its long-term fluctuations depend on fluctuations in the annual amount of evaporation which varies to a greater degree than variability of annual runoff of rivers flowing into the sea. Runoff losses in the Amudar'ya and Syrdar'ya deltas are directly dependent on amount of inflow to the deltas and thus reduce the range of level fluctuations of the sea. The subsurface component of the sea's water balance is small and has little effect on the sea's level fluctuations. (Josefson-USGS)
W74-07194

OPTIMAL LINEAR EXTRAPOLATION OF LEVEL FLUCTUATIONS OF CLOSED WATER BODIES (OPTIMAL'NAYA LINEYNAYA EKSTRAPOLYATSIYA KOLEBANIY UROVNYA ZAMKNUTYKH VODOYEMOV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4A.
W74-07195

ON THE DETERMINATION OF TURBULENT DIFFUSIVITY IN SHALLOW WATERS BY AERIAL PHOTOGRAPHY OF FLOATING MARKERS,
Texas A and M Univ., College Station. Dept. of Meteorology.
D. Djuric, and H. R. Leribaux.
Limnology and Oceanography, Vol 19, No 1, p 138-144, January 1974. 6 fig, 3 ref.

Descriptors: *Dispersion, *Lakes, *Aerial photography, Measurement, *Diffusivity, Currents(Water), *Remote sensing.

Aerial photography was used in an experiment with 200 floating markers to determine their dispersion on the surface of a lake. The dispersion proceeded with a practically constant diffusivity coefficient, independent of the size of the diffusing cluster. (Knapp-USGS)
W74-07316

SEDIMENT DISCHARGE IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972 WATER YEAR,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W74-07326

SUMMERTIME TEMPERATURE AND CIRCULATION PATTERNS IN LAKE SUPERIOR,
Wisconsin Univ., Madison. Dept. of Meteorology.
N. P. Smith.
Available from the National Technical Information Service as PB-231 785 $14.50 in paper copy, $1.45 in microfiche. Ph.D. Thesis, 1972, 205 p, 102 fig, 2 tab, 44 ref. OWRR B-009-WIS(7) 14-01-0001-1057.

Descriptors: *Lake Superior, Lakes, *Mixing, *Water Circulation, *Stratification, Movement, Winds, Bathythermographs, *Water Temperature, *Water Currents, Coriolis forces, Model studies.
Identifiers: Keweenaw Peninsula, Isle Royale.

Lake Superior current and temperature data collected during the summer of 1966 and 1967 are combined to provide a description of the summer circulation and temperature structure. Data are largely from the central part of the lake, between the Keweenaw Peninsula and Isle Royale. Circulation and temperature patterns appear to be closely interrelated. Infrared surface temperature patterns from eight flights between July 7 and October 1, 1966, trace the formation of the epilimnion and indicate nearshore packing of surface isotherms along the southern shore of the lake in early summer. Bathythermograph temperature cross-sections from five cruises during the summer of 1967 indicate sharply sloping isothermal surfaces north of the Keweenaw Peninsula in early summer and a well defined thermocline established by early August. The dynamic height method is used to compute the corresponding geostrophic currents. Early summer speeds are as high as 40 cm/sec in an easterly, nearshore current. Measured currents from two buoy stations moored just north of the Keweenaw Peninsula in 1966 are similar in speed and direction, suggesting that the early summer current is primarily baroclinic in nature. Nearshore and mid-lake temperature recorder data from both 1966 and 1967 indicate rapid warming in the upper 20 to 25 meters once the water column has reached the temperature of maximum density. Progressive vectors and vector frequency diagrams indicate that current speeds increase in early August. The average computed flow is 22,210 m3/sec. Energy density spectra indicate that inertial motion is a major component of the current at locations from shore.
W74-07338

IN COMPARISON OF THE FOOD OF SALAMANDERS AND FISH IN MARION LAKE, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
E. Efford, and K. Tsumura.
Trans Am Fish Soc. Vol 102 No 1 p 33-47, 1973. Illus.
Identifiers: Ambystoma-Gracile, *Canada(Marion Lake-B.C.), *Fish food, Lakes, Oncorhynchus-Nerka, *Salamanders, Salmo-Gairdneri, Taricha-Granulosa, Rainbow trout, Kokanee.

The gut content of rainbow trout (Salmo gairdneri), kokanee (Oncorhynchus nerka), and 2 salamanders (Ambystoma gracile and Taricha granulosa) from Marion Lake, British Columbia, Canada, were compared. The species found in these 4 predators were very similar but each predator concentrated on different prey. The kokanee concentrated on species present at the surface or in the water column, and the trout on larger benthos. The salamanders also fed on benthos but usually chose smaller size classes. In comparing the effect of the 4 predators, the average volume of food present by weight in the gut was multiplied by a proportional converter for the rate of passage through the gut, the mean meal size, and by the number of individuals in the population. The results suggested that S. gairdneri ate over half by weight (56%) of all the food taken by the 4 predators combined; kokanee and A. gracile were less important and consumed 25% and 19%, respectively; and T. granulosa because of its low number and slow growth was unimportant (1%). -- Copyright 1973, Biological Abstracts, Inc.
W74-07349

A PRELIMINARY DESCRIPTION OF THE PHYSICO-CHEMICAL CHARACTERISTICS AND BIOTA OF THREE STRIP MINE LAKES, SPENCER COUNTY, INDIANA,
Saint Meinrad Coll., Ind. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-07403

SURFACE TEMPERATURES OF LAKE ERIE,
Atmospheric Environment Service, Downsview (Ontario).
M. S. Webb.
Water Resources Research, Vol 10, No 2, p 199-210, April 1974. 18 fig, 1 tab, 19 ref.

Descriptors: *Water temperature, *Lake Erie, Air temperature, Limnology, *Remote sensing, Surveys, Solar radiation, Seasonal, Great Lakes, *Mapping.
Identifiers: *Radiometers.

The spatial patterns of the mean surface temperature of Lake Erie were mapped by data from 58 airborne radiation thermometer surveys obtained over a 6-year period. The lakes southern location within the Great Lakes system and the large differences in water depth between its three basins are important controls affecting the surface temperature regime. Except in winter, when it is largely ice covered, the surface of Lake Erie is warmer than the surfaces of any of the other Great Lakes. Month-by-month relationship between the mean surface temperature and the mean air temperature is domonstrated. (Knapp-USGS)
W74-07415

THE ESTIMATION OF VERTICAL EDDY DIFFUSIVITIES BELOW THE THERMOCLINE IN LAKES,
California Univ., Davis. Dept. of Physics.
T. Powell, and A. Jassby.
Water Resources Research, Vol 10, No 2, p 191-198, April 1974. 4 fig, 4 tab, 44 ref. Rockefeller Grant 3-440405-57151-2 NSF Grant GA-34099.

Descriptors: *Limnology, *Thermocline, *Mixing, *Diffusivity, *Turbulence, Dispersion, Diffusion, Mass transfer, Heat transfer, Convection, Advection, Water temperature, Density currents, Path of pollutants, Energy budget.

Methods of estimating vertical eddy diffusivity coefficients in lakes for such substances as temperature, inorganic ions, or biologically active materials are briefly reviewed. One widely used method, and McEwan method, is discussed, and it is shown how this method can lead to erroneous results. Another method, the flux gradient method, is examined and compared with the McEwan method in specific case studies of thermal energy transfers. Lack of agreement between values obtained by the McEwan method and the flux gradient method has led some investigators to postulate a flux of thermal energy into the deep layers of a lake by density currents. An alternative explanation of the discrepancy is that deepwater turbulent mixing may result from a microstructure of layers and sheets caused by, for example, a Kelvin-Helmholtz shear instability in the flows or other instability mechanisms. (Knapp-USGS)
W74-07416

INSTABILITY OF WATER COOLED FROM ABOVE,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
D. M. Snider, and R. Viskanta.
Paper presented at First World Congress on Water Resources, Chicago, Illinois, September 24-28, 1973. 12 p, 6 fig, 12 ref. OWRR A-029-IND(4).

Descriptors: *Thermal properties, *Thermal stratification, *Thermoline, *Convection, *Conduction, *Evaporation, Heat transfer, Energy transfer, Thermal radiation, Infrared radiation, Interferometry.
Identifiers: Mach-Zehnder interferometer.

The temperature field and convection currents induced in water by convection, evaporation and radiation cooling of its surface are studied. These phenomena occur naturally and continuously in any lake, pond, reservoir or a river but they remain usually unobserved. Mach-Zehnder interferograms taken from the side of a tank of water were used to measure the temperature distribution and to study the convective currents induced by cooling from the surface. Experiments were performed with initially uniform and thermally-stratified layers of water. Both qualitative and quantitative results of preliminary nature for temperature distribution are presented. Interferograms vividly reveal mixing motions induced by instabilities arising in the surface layer. The onset of manifest convective behavior was determined by visual observations of interferograms.
W74-07458

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART B),
Notre Dame Univ., Ind. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-07466

SEASONAL ABUNDANCE AND VERTICAL DISTRIBUTION OF CRUSTACEAN ZOOPLANKTON IN A COLOURED DYSTROPHIC LAKE IN NORTHEASTERN ONTARIO,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Environmental Research Branch.
For primary bibliographic entry see Field 5C.
W74-07467

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W74-07484

A STUDY OF THE COMMUNITIES OF INVERTEBRATES OF PLANTS OF LAKE CHAD: PRELIMINARY INQUIRES, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Fort-Lamy (Chad).
C. Dejoux, and L. Saint-Jean.
Cah ORSTOM Ser Hydrobiol. Vol 6, No 1, p 67-83. 1972, Illus, (English summary).
Identifiers: Ceratophyllum, *Chad(Lake Chad), Cladocera, Copepoda, *Invertebrates, Lakes, Potamogeton, *Aquatic plants.

A new apparatus was used to collect plant samples from a constant volume. A method is proposed to estimate variations of vegetal biomass of a weed. The horizontal distribution in invertebrates looks like a binomial distribution, the first approximation. The organisms are distributed in aggregates. In the eastern part of lake Chad, the vertical variations which occur in the distribution of invertebrates populations in water plants are such that superficial samples could be considered as representative. The fauna sheltered by aquatic

plants is original in regard to the benthic or pelagic fauna. The places inside Potamogeton or Ceratophyllum weeds which are free of vegetation show the same planktonic forms (Copepoda and Cladocera) as the adjacent pelagic area, sensu stricto. All ecological study which includes cyclic factors must be followed in the same weed or located in the same area of a large weed.--Copyright 1973, Biological Abstracts, Inc.
W74-07538

LEECH COMMUNITIES (HIRUDINEA) IN THE MAZURIAN AND BIALYSTOK REGIONS AND THE POMERANIAN LAKE DISTRICT,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
For primary bibliographic entry see Field 5C.
W74-07542

VERTICAL MIGRATION OF SPANIOTOMA AKAMUSI LARVAE (DIPTERA:CHIRONOMIDAE) THROUGH THE BOTTOM DEPOSITS OF LAKE SUWA,
Teikyo Univ., Hachioji (Japan). Dept. of Zoology.
H. Yamagishi, and H. Fukuhara.
Jap J Ecol. Vol 22, No 5, p 226-227. 1972, Illus.
Identifiers: Bottom deposits, *Chironomidae, Chironomus-Plumosus, *Diptera, *Japan(Lake Suwa), Larvae, Spaniotoma-Akamusi, *Vertical imigration, Standing crops.

The burrowing behavior of S. akamusi larvae tends to isolate them from other benthic animals, especially Chironomus plumosus larvae. Consequently, C. plumosus larvae do not compete with S. akamusi for food, and they therefore grow rapidly, resulting in a high annual maximum standing crop (about 2000 individuals/m2 in June, 1969).--Copyright 1973, Biological Abstracts, Inc.
W74-07543

BYGLANDSFJORDEN. PRIMARY PRODUCTION AND OTHER LIMNOLOGICAL FEATURES IN AN OLIGOTROPHIC NORWEGIAN LAKE,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 5C.
W74-07554

EFFECT OF RESTRICTED USE OF PHOSPHATE-BASED DETERGENTS ON ONONDAGA LAKE,
O'Brien and Gere Engineers Inc., Syracuse, N. Y.
For primary bibliographic entry see Field 5C.
W74-07566

ABUNDANCE AND MORTALITY OF THE PERCH FRY (PERCA FLUVIATILIS, LINNACUS, 1758) IN THE KLICAVA RESERVOIR,
Karlova Universita, Prague (Czechoslovakia). Inst. of Zoology.
For primary bibliographic entry see Field 8I.
W74-07588

NEMATODE FISHE PARASITES FROM SANGALKAM, SENEGAL,
Laboratoire National de l'Elevage et de Recherches Veterinaires, Dakar (Senegal).
G. Vassiliades.
Bull Inst Fondam Afr Noier Ser A Sci Nat. Vol 34, No 3, p 529-533. 1972.
Identifiers: Camellanus-Ctenopomae, Clarias-Senegalensis, Ctenopoma-Kingsleyae, *Fish parasites, *Nematodes, Procamallanus-Laeviconchus, Procamallanus-Senegalensis, Quimperia-Lanceolata, *Senegal(Sangalkam marsh), *Marshes.

Sangalkam is a freshwater marsh region 36 km northeast of Dakar, where perennial water leads to luxuriant vegetation. Procamallanus laeviconchus and P. senegalensis occur in Clarias senegalensis; Camellanus ctenopomae and Quimperia lanceolata in Ctenopoma kingsleyae. The life cycles of the Camellanidae include a copepoid intermediate host; that of Q. lanceolata is incompletely known. Laboratory studies indicate that development is sometimes direct or sometimes involves an intermediate host which may be a fish or an insect.--Copyright 1973, Biological Abstracts, Inc.
W74-07589

FERTILITY OF THE FISH FROM VARVARA RESERVOIR, (IN RUSSIAN),
For primary bibliographic entry see Field 8I.
W74-07591

EFFECT OF ANHYDROUS AMMONIA ON A CENTRAL TEXAS POND, AND A REVIEW OF PREVIOUS RESEARCH WITH AMMONIA IN FISHERIES MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-07595

2I. Water In Plants

SUBSURFACE HEATING AND IRRIGATION OF SOILS: ITS EFFECT ON TEMPERATURE AND WATER CONTENT AND ON PLANT GROWTH,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-07054

EFFECT OF SEEDING RATES AND ROW SPACINGS ON FODDER PRODUCTION OF MOTH BEAN (PHASEOLUS ACONITIFOLIUS),
Central Sheep and Wool Research Inst., Jaipur (India).
For primary bibliographic entry see Field 3F.
W74-07091

ANNOTATED CHECKLIST AND HOST INDEX FOR ARIZONA WOOD-ROTTING FUNGI,
Arizona Univ., Tucson.
R. L. Gilbertson, K. J. Martin, and J. P. Lindsey.
Agricultural Experiment Station, University of Arizona, Tucson, Technical Bulletin 209, February 1974. 48 p, 9 ref.

Descriptors: *Rots, *Pathogenic fungi, *Fungi, *Plant diseases, Trees, Forests, *Arizona, Vascular tissues, Brush.
Identifiers: *Wood-rotting fungi.

The wide variety of ecological zones, from hot deserts to alpine tundra, has given Arizona a rich flora of woody plants that provide a potential substratum for wood-rotting fungi. Although annual rainfall is relatively low in most areas of the state, much of it falls in the summer monsoon season during which conditions are favorable for fungal growth. A total of 385 species of wood-rotting fungi which have been identified in Arizona are catalogued by order, family, genus and species. Their general environment and associated fauna are also identified. A list includes the species of host on which each was found and the Arizona county in which the find was made. An index of 117 wood-rotting fungi hosts is presented with a list of fungi which attack the hosts and the nature of the rot which develops. (Muller-Arizona)
W74-07097

THE SAGUARO GIANT CACTUS, A BIBLIOGRAPHY,
National Park Service, San Francisco, Calif.
W. F. Steenbergh.
February 1974. 24 p, 217 ref.

Descriptors: *Bibliographies, *Desert plants, *Cacti, *Plant physiology, Arid lands, Deserts, Vegetation, Xerophytes, Plant morphology, Plant populations, Water balance.
Identifiers: *Saguaro Cactus.

A comprehensive bibliography is presented of the literature pertaining to the saguaro giant cactus (Cereus giganteus Engelm., Carnegiea gigantea Engelm. Britt. and Rose). Two hundred and seventeen references dating from 1795 to 1972 reflect the scientific preoccupation with this plant native only to the Sonoran Desert. Its physiology, morphology, distribution, and water balance are among the many topics covered. (Muller-Arizona)
W74-07098

PRODUCTIVITY AND WATER STRESS IN CACTI,
Arizona State Univ., Tempe.
D. T. Patten, and R. A. Nisbet.
Desert Biome, U.S. International Biological Program, Research Memorandum, RM 73-11, 1972 Progress Report, May 1973. 18 p, 8 fig, 3 tab, 5 ref.

Descriptors: *Productivity, *Adaptation, *Cacti, *Moisture stress, *Biomass, Dehydration, Drought resistance, Drought tolerance, Regime, Photosynthesis, Regressive analysis, Desert plants, Carbon dioxide, Solar radiation, Temperature, Moisture content, Growth rates, Southwest U.S., Mexico.
Identifiers: *Sonoran Desert.

Temperature and moisture primarily affect the production of biomass in prickly pear cacti (Opuntia phaeacantha var. discata). Buckhorn cholla (Opuntia acanthocarpa) was also studied for comparison purposes. Measurements of all plants were taken in situ, and included growth rate, air and soil temperature, rainfall, plant temperature, carbon dioxide, and water rates. Evidence shows that for cacti, optimum photosynthetic rates occur during the cool season or at cooler temperatures. Most new biomass accumulation occurs in winter prior to new pod and bud formation. Winter growth rates can appear to be offset by dehydration during abnormal drought periods; however, a reduced dehydration rate is an indicator of biomass accumulation. Prickly pear cacti appear to have a higher productivity potential than buckhorn cholla, but the latter appears to be better adapted to higher temperatures. Prickly pear also appears to conserve water better although both are well able to survive drought conditions of the Sonoran Desert. (Mastic-Arizona)
W74-07109

DISTILLATION-CONDENSATION OF WATER AND NUTRIENT MOVEMENT IN A DESERT ECOSYSTEM,
Nevada Univ., Reno. Desert Research Inst.
N. Stark.
Desert Biome, U.S. International Biological Program, Research Memorandum, RM 73-44, 1972 Progress Report, May 1973. 24 p, 9 tab, 17 ref.

Descriptors: *Distillation, *Condensation, *Nutrients, *Desert plants, *Soil-water-plant relationships, Infiltration, Canopy, Root systems, Shrubs, Cation exchange, Throughfall, Stemflow, Litter, Moisture content, Growth rates, Permeability, Leachate, Elements(Chemical), Ecosystems, Organic matter, Soils, Soil chemistry, Hydrogen ion concentration.
Identifiers: Water-holding capacity, Seedlings, Microwatershed, Mojave Desert, *Death Valley, Bursage, Creosotebush, Saltbush.

The importance of distillation-condensation in the soil as a water and nutrient source for desert plants was studied. The study concentrated on Larrea divaricata, Franseria dumosa, and Atriplex confertifolia vegetation on rocky, gravelly soils in Death Valley. Soils immediately beneath shrubs displayed a higher permeability than soils of shrub

interspaces, despite a raised mound of soil at the base of each shrub. It is hypothesized that in addition to throughfall and stemflow, water supply is enhanced by microwatershed attributes of the surrounding soil surfaces. Variation in soil chemistry beneath the three species of shrubs is derived from pH values, water-holding capacity, cation exchange capacity, and elemental content. The data suggest that the plant roots modify their immediate chemical environment to increase nutrient concentrations and decrease potential toxicities. Methodology was inadequate to measure the quantity or quality of condensation water. (Mastic-Arizona)
W74-07110

EXTRUDED PEAT CYLINDERS: THEIR PHYSICAL CHARACTERISTICS AS AFFECTING TREE SEEDLING GROWTH AND GREENHOUSE DROUGHT TOLERANCE,
Research Council of Alberta, Edmonton.
D. L. Mitchell, D. Hocking, and W. C. Kay.
Can J For Res. Vol 2, No 4, p 479-486, 1972. Illus.
Identifiers: Absorption, Densities, *Drought tolerance, Greenhouse, Growth, Moisture, *Peat cylinders, *Pinus-contorta-var-latifolia, *Tree seedlings.

Seedlings (Pinus contorta Dougl. var. latifolia Engelm.) were grown in containers formed by extruding a peatwater mixture into flexible plastic tubing. The reduction in particle size of the peat that occurs during extrusion improved the rate of moisture absorption and decreased the rate of moisture loss. A range of peat densities of extruded peat cylinders (sausages) was prepared through control of the water content in the feed mixtures. Seedlings grown in sausages show decreased growth as the peat density is increased. Compared to rigid tubes filled with loose peat, seedlings in sausages are less subject to drought.--Copyright 1973, Biological Abstracts, Inc.
W74-07180

A CONTRIBUTION TO THE BOTANY OF GANGANAGAR DISTRICT, NORTH RAJASTHAN,
Seth G. N. Khalsa Coll., Sri Ganganagar (India).
For primary bibliographic entry see Field 3F.
W74-07357

PORTABLE REFLECTANCE METER FOR ESTIMATING CHLOROPHYLL CONCENTRATIONS IN LEAVES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W74-07437

AMMONIUM AND NITRATE UPTAKE BY CORN (ZEA MAYS L.) AS INFLUENCED BY NITROGEN CONCENTRATION AND NH4(+)/NO3(-) RATIO,
Michigan State Univ., Lansing.
For primary bibliographic entry see Field 3F.
W74-07459

THE PAST AND PRESENT FLORA AND VEGETATION OF THE HACKENSACK MEADOWS,
W. S. Sipple.
Bartonia. 41, p 4-56. 1971/1972.
Identifiers: Aerial photography, Destruction, *Flora, Forest habitat, Marshes, *Meadows, *New Jersey(Hackensack meadows), *Mapping, Ruderal, Sea, *Vegetation.

The Hackensack Meadows is located in the Triassic lowlands, a subdivision of the Piedmont Province in NE New Jersey. Most areas are less than 5 ft above sea level. Field work was done in the study area during Sept. 1969. Data were then correlated with patterns of apparent vegetation types appearing on aerial photographs taken in June 1969. Additional field work was done in spring and summer, 1970 to corroborate vegetation types and verify the mapping. Older publications were consulted, and herbarium specimens checked to reconstruct the vegetation. Nineteen vegetation types are described and grouped into the general categories: marshes, forested areas, meadows and ruderal plants. Using data from the literature, including pollen analysis, the vegetation is described from post-Wisconsinan glacial time to the present, with separate descriptions for 1819, 1889, 1919, 1949 and 1969. The major factors causing vegetation in recent times are the constant rise of sea level and the diking of various bog areas and many related effects from advancing civilization such as lumbering, water table subsidence, fire and the neglect of older dikes which restored some of the earlier tidal influence to some areas.--Copyright 1973, Biological Abstracts, Inc.
W74-07476

PHENOLOGY OF A TROPICAL RAIN FOREST IN MALAYA,
L. Medway.
Biol J Linn Soc. Vol 4, No 2, p 117-146. 1972. Illus.
Identifiers: Flowering, *Forests, Fruiting, *Malaya, Malaysia, *Phenology, *Rain forests, Seasonality, *Tropical rains.

During 1960-1969, observations were made of flowering, fruiting, and foliar activity of 61 canopy trees (representing 45 spp.) in a largely undisturbed tract of Hill Dipterocarp Forest (Malaysia). Rainfall was measured by an accumulating gauge and, at a nearby station, the number of rainy days recorded. Annually recurrent floral cycles were displayed by only 10 spp. In these and in 11 additional species, foliar cycles were also circannual. Gregarious flowering, apparently in response to drought, occurred in many species in 1963 and 1968. In other years, interspecific differences in periodicity maintained a minimal incidence of flowering at 44%, and fruiting at 27% of species in the sample. Despite specific variations in phenology, the community as a whole exhibited regular seasonality, with single annual peaks of flowering and fruiting and a double peak of leaf production.--Copyright 1973, Biological Abstracts, Inc.
W74-07482

SHORT-TERM RESPONSE IN UNGULATE NUMBERS TO RAINFALL IN THE NOSSOB RIVER OF THE KALAHARI GEMSBOK NATIONAL PARK,
Pretoria Univ. (South Africa). Dept. of Zoology.
J. Du P. Bothma.
Koedoe. 15 p 127-133, 1972. Illus.
Identifiers: Blue wildebeest, Gemsbok, *Grazing animals, Red hartebeest, National parks, Nossob River, Rainfall, Springbok, *Ungulate, Vegetation, Wildebeest, *South Africa(Kalahari Gemsbok National Park).

The ungulate fauna of the Kalahari Gemsbok National Park (South Africa), an area without permanent water, must adapt their movements rapidly to changing vegetation patterns after a good rainfall. Four ungulates, the gemsbok, springbok, red hartebeest and blue wildebeest were observed in the Nossob River bed area from 3 mo. following the onset of the 1972 summer rains. The springbok and red hartebeest moved into the area in increased numbers as grazing conditions improved. Gemsbok waited until the vegetation was tall enough to be utilized. Blue wildebeest numbers declined, despite improved grazing conditions; however, this might have been due to the start of their annual east-west movement during the winter months following the rains.--Copyright 1973, Biological Abstracts, Inc.
W74-07535

TAXONOMIC COMPOSITION OF AQUATIC INVERTEBRATES OF THE DON BASIN IN COMPARISON WITH FAUNA OF THE OTHER RIVERS OF THE BLACK SEA CASPIAN BASIN, (IN RUSSIAN),
T. V. Sklyarova.
Zap Voronezh S-Kn Inst. 47 p, 198-204. 1972.
Identifiers: Aquatic animals, Black Sea, Caspian Sea, Ecological studies, Fauna, *Invertebrates, Rivers, *Taxonomic studies, *USSR(Don basin).

In the Don basin (USSR) 1072 taxa of invertebrates were recorded. Owing to the diversity of ecological conditions, the Upper Don has more than double the number of species in comparison with the Lower Don. With respect to the character of the aquatic fauna among rivers of the Black Sea-Caspian basin the Don is most similar to the Dnepr and then to the Volga, which belong, just as the Don, to plains rivers. The similarity between the fauna of the Don and Dnestr is manifested to a lesser degree, since the Dnestr is a river with a mountainous catchment area and has different ecological conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-07537

STRUCTURE OF FISH GROUPINGS IN THE RIVERS AND STREAMS OF THE RIVER NIDA DRAINAGE BASIN,
Lodz Univ. (Poland). Faculty of Biology and Earth Sciences.
T. Penczak.
Ekol Pol. Vol 20, No 26, p 327-344. 1972, Illus.
Identifiers: Drainage basins, *Poland(River Nida), Rivers, Streams, Suckers, *Fish species.

A collection of 16,005 fish and suckers collected at 117 fishing sites from the River Nida (Poland) drainage basin was arranged with the help of cenological methods. Similar river zones were distinguished on the basis of dominating and other fish species. These zones are different from the zones or reaches distinguished on the basis of river fall or on other morphological elements used to characterize the rivers and streams. The problems of combined or separated occurrence of fish species and the degree of their ecological relations were also investigated. An attempt was made to distinguish the characteristic, transistory and eurytopic fish species in the studied area.--Copyright 1973, Biological Abstracts, Inc.
W74-07539

THE MARINE DIATOM ETHMODISCUS REX: ITS MORPHOLOGY AND OCCURRENCE IN THE PLANKTON OF THE SARGASSO SEA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5A.
W74-07547

PRELIMINARY DIAGNOSIS OF A NEW SPECIES OF MARINE ISOPOD FROM STEWART ISLAND,
Oceanographic Inst. (New Zealand). Department of Scientific and Industrial Research, Wellington.
K. P. Jansen.
New Zealand Journal of Marine and Freshwater Research, Vol 7, No 3, p 261-262, September 1973. 1 fig, 2 ref.

Descriptors: *Isopods, *Systematics, Marine animals, Speciation.
Identifiers: *Paravireia, *New Zealand(Stewart Island), Animal morphology.

Four isopod specimens were collected from bottom mud in shallow water in Paterson Inlet, Stewart Island, by the Zoology Department, Victoria University of Wellington, in June 1972. The isopods belong to the genus Paravireia Chilton, but morphological differences exclude them from Paravireia typicus Chilton 1925, from the Chatham Islands, the only previously described species in the genus. The present paper is to establish a valid specific name for a forthcoming ecological study

without the precipitate erection of a new major taxon. This species is distinguished from Paravireia typicus by the smoothly rounded profile of the pleotelson and by the produced apices and setal tufts of the epimers of pereonites 3 and 4. No other records of the species are known. (Mortland-Battelle)
W74-07570

STOMATAL MECHANICS,
Connecticut Agricultural Experiment Station, New Haven. Dept. of Ecology and Climatology.
D. E. Aylor, J.-Y. Parlange, and A. D. Krikorian.
Am J Bot. Vol 60, No 2, p 163-171, 1973. Illus.
Identifiers: *Stomatal studies, *Turgor, Model studies, *Plant cell models.

A model of stomatal movement due to changes in turgor is presented which systematically illustrates the role of certain anatomical features. During the expansion of paired guard cells, there are 2 physical constrainst that cause the guard cells to bend and thus open the stomatal pore. The radial orientation of the micellae is shown to be the crucial feature which directly transmits the movement of the dorsal wall of the polar and central section to the stomatal slit. Furthermore, it is necessary that either the overall length of the entire stomatal apparatus or length of the common wall between the polar segments of the guard cells be constrained during the expansion of the guard cells. The model also shows that asymmetrically thickened guard cell walls are not necessary to cause bending of the guard cell. The ideas set forth in the model are consistent with the opening movements of both elliptical and grass-type stomata.--Copyright 1973, Biological Abstracts, Inc.
W74-07593

2J. Erosion and Sedimentation

SAND DUNE RECLAMATION IN IRAQ -- PRESENT STATUS AND FUTURE PROSPECTS,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
J. Dougrameji, and R. N. Kaul.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 133-144, Sept. and Dec. 1972. 4 fig, 4 tab, 6 ref.

Descriptors: *Wind erosion, *Soil stabilization, *Windbreaks, *Dune sands, *Erosion control, Arid lands, Grazing, Soil treatment, Soil erosion, *Vegetation establishment, Vegetation regrowth, Droughts, Slope stabilization, Sands, Clays, Dry farming, Land reclamation, Mechanical control, Brush.
Identifiers: *Iraq.

Principal causes of shifting dunes over large areas of Iraq are drought, exploitation of natural vegetation, improper agricultural practices including overgrazing by livestock, and poor canal dredging operations. Extended rainless periods have prompted building of windbreaks near cultivated fields to cut down on erosion which, together with attempts at establishment of both native and introduced vegetation, will provide a beginning pattern for dune stabilization. Research has supplied information on soil physical factors, vegetation species best suited to the needs, and preliminary effects of mechanical barriers, the most successful of which is placement of brush barriers on the windward side of the dune in parallel lines oriented across the prevailing wind direction. This procedure is more efficient for inland dunes such as those in India and Iraq than the bituminous sprays used for coastal dunes in Libya, Morocco, and Tunisia. Also described are methods for seeding and transplantation. (Muller-Arizona)
W74-07104

DRAINAGE DENSITY AND EFFECTIVE PRECIPITATION,
For primary bibliographic entry see Field 2A.
W74-07155

BASIN PLAINS IN THE EASTERN MEDITERRANEAN: SIGNIFICANCE IN INTERPRETING ANCIENT MARINE DEPOSITS: 1. BASIN DEPTH AND CONFIGURATION,
Smithsonian Institution, Washington, D.C. Div. of Sedimentology.
D. J. Stanley.
Marine Geology, Vol 15, No 5, p 295-307, December 1973. 5 fig, 1 tab, 28 ref. Smithsonian Grant 430035.

Descriptors: *Bottom sediments, *Turbidity currents, Stratigraphy, Sediment transport, Deposition(Sediments).
Identifiers: *Mediterranean(Eastern basin), Flysch.

Basins in the eastern Mediterranean, and particularly those associated with the Hellenic Arc, accumulate rhythmically stratified deposits which resemble flysch formations. The eastern Mediterranean basin plains, except those off the Nile Cone, are bounded by slopes that exceed 3 deg and in some cases 40 deg; the topographic characteristics and distribution of these basins reflect the intense structural activity in this region. Depths in the Aegean Sea range from less than 200 to over 2500 m (basin plain area ranges from 10-1,380 sq km); plains in the Sea of Crete are less elongate than those in other provinces. Depressions south of the Peloponnesus-Crete-Rhodes island arc include a number of long, very narrow (1-3 km wide) trenches that are generally small (25-200 sq km) and deep (> 3000 m). The largest depressions, the Herodotus and Sirte abyssal plains, south of the Mediterranean Ridge also exceed 3000 m. Although most basins occur at depths exceeding 1000 m, there are excellent examples of shallower (< 3000 m) turbidite sand and mud sequences in basins and base-of-slope environments in the Aegean. Vertical tectonic movement locally exceeds rates of sediment accumulation resulting in structural lowering of deposits into deeper water. (Knapp-USGS)
W74-07158

AN IMPROVED CORE CATCHER FOR THE KIEL BOX CORER ('KASTENLOT'),
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
For primary bibliographic entry see Field 7B.
W74-07159

SEDIMENTATION BY NON-TIDAL CURRENTS AROUND NORTHERN DENMARK,
Institute of Oceanographic Sciences, Wormley (England).
For primary bibliographic entry see Field 2L.
W74-07160

DEPOSITIONAL FEATURES OF BRAIDED-MEANDERING STREAM,
Oklahoma State Univ., Stillwater. Dept. of Geology.
J. W. Shelton, and R. L. Noble.
American Association of Petroleum Geologists Bulletin, Vol 58, No 4, p 742-749, April 1974. 5 fig, 1 tab, 40 ref.

Descriptors: *Sedimentary structures, *Braiding, *meanders, Alluvial channels, *Oklahoma, Channel morphology, Sediment sorting, Stratigraphy, Discharge(Water), Sand bars, Sedimentology.
Identifiers: *Cimarron River(Okla).

The Cimarron River in north-central Oklahoma shows characteristics intermediate between typical braided and meandering streams. The gradient is 1.8 ft per mi; the sinuosity is 1.5; and average channel depth at bankfull stage is 15 ft. Accretion ridges on the downstream sides of bars characterize the straighter reaches, whereas accretion ridges on both the upstream and downstream sides are in the more sinuous reaches. The deposits show upward fining; they are generally fine- to medium-grained, well-sorted sand, with scattered pebbles. Horizontal bedding and medium-scale and small-scale crossbedding are the dominant sedimentary structures. Compared to typical meandering-stream deposits, the Cimarron River deposits are thinner but wider, and they contain less fine-grained clastics in the upper part of the sequence and as clay interbeds. The Cimarron sediments are finer grained and better sorted than sands of typical braided streams. They contain more horizontal bedding than either braided- or meandering-stream deposits. The type of sand deposit represented by the Cimarron River sand may be similar to certain ancient alluvial sandstones which were deposited during either basinal subsidence or eustatic rise in sea level. ((Knapp-USGS)
W74-07163

GEOLOGIC ASPECTS OF WASTE SOLIDS AND MARINE WASTE DEPOSITS, NEW YORK METROPOLITAN REGION,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W74-07171

REMANENT MAGNETIZATION OF MODERN TIDAL FLAT SEDIMENTS FROM SAN FRANCISCO BAY, CALIFORNIA,
Stanford Univ., Calif. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07173

LINE INTERSECTION METHOD FOR ESTIMATING DRAINAGE DENSITY,
British Columbia Univ., Vancouver. Dept. of Geography.
D. M. Mark.
Geology, Vol 2, No 5, p 235-236, May 1974. 1 fig, 1 tab, 3 ref.

Descriptors: *Drainage density, *Maps, *Terrain analysis, *Drainage patterns(Geologic), Geomorphology, Methodology, Estimating.
Identifiers: *Line intersection method.

The line intersection method for estimating drainage density using maps involves counting the number of intersections with the drainage net per unit length of sample traverse line and multiplying the result by a correction coefficient. Theoretical and empirical evidence indicates that this coefficient should be 1.571. (Knapp-USGS)
W74-07174

SAND-WAVE FIELDS IN TAIWAN STRAIT,
Oregon Univ., Eugene. Dept. of Geology.
S. Boggs, Jr.
Geology, Vol 2, No 5, p 251-253, May 1974. 2 fig, 10 ref.

Descriptors: *Sand waves, *Bottom sediments, *Sediment transport, Sedimentary structures, Currents(Water), Ocean currents, Particle size, Tides.
Identifiers: *Taiwan Strait.

Sand waves were detected by echo sounding in several areas of the shallow shelf northwest and west of Taiwan. They occur in fields 5 to 30 km in width, at water depths ranging from 20 to 90 m. The height of the sand waves primarily ranges from 5 to 8 m, and their average length ranges from about 100 to 500 m. The asymmetrical shape of most of the waves suggests that they migrate in response to present-day hydraulic conditions. Orientation of the steepest faces of the sand waves is quite variable, indicating that the pattern of bottom current movement in Taiwan Strait is probably quite complex. (Knapp-USGS)
W74-07175

A NOTE ON THE AREAL DISTRIBUTION OF SUSPENDED SEDIMENT YIELD IN SOUTH AFRICA,
Nottingham Univ. (England).
J. C. Doornkamp, and P. D. Tyson.
Journal of Hydrology, Vol 20, No 4, p 335-340, December 1973. 3 fig, 12 ref.

Descriptors: *Sediment yield, *Suspended load, Equations, Africa, Erosion, Soil erosion, Topography, Rainfall, Weathering, Silts, Sediment transport, Runoff.
Identifiers: *South Africa, Fournier equation.

Suspended sediment yield was calculated by means of Fournier's equations for 214 locations in South Africa. The areal distributions agree well with field data. Areas of pronounced relief yield most suspended sediment, especially from the Transvaal Escarpment zone, northeast Lesotho, the Natal Drakensburg, and the Cape Mountains. Locally high values occur inland (for example, in the Waterberg Plateau north of Nylstroom). Valley rainfall records inadequately define mountain precipitation leading to an underestimate of likely actual values of sediment yield in some areas. Man-induced soil erosion locally increases suspended sediment yields, as do areas of deeply weathered bedrock. (Knapp-USGS)
W74-07177

BIODEPOSITION AS A FACTOR IN SEDIMENTATION OF FINE SUSPENDED SOLIDS IN ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W74-07231

SPATIAL AND TEMPORAL DISTRIBUTION OF SUSPENDED SEDIMENT IN NARRAGANSETT BAY AND RHODE ISLAND SOUND,
Naval Underwater Systems Center, Newport, R.I.
For primary bibliographic entry see Field 2L.
W74-07232

SUSPENDED SEDIMENT TRANSPORT IN DELAWARE BAY,
Millersville State Coll., Pa.
For primary bibliographic entry see Field 2L.
W74-07233

DISTRIBUTION AND TRANSPORTATION OF SUSPENDED SEDIMENT IN UPPER CHEASAPEAKE BAY,
Johns Hopkins Univ. Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2L.
W74-07234

RIO DE LA PLATA ESTUARY ENVIRONMENTS,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W74-07236

MASS PHYSICAL AND ENGINEERING PROPERTIES OF SOME YORK RIVER SEDIMENTS,
Lafayette Coll., Easton, Pa. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07239

STRONTIUM ISOTOPE COMPOSITION AND SEDIMENT TRANSPORT IN THE RIO DE LA PLATA ESTUARY,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W74-07240

RECENT ESTUARINE SEDIMENT HISTORY OF THE ROANOKE ISLAND AREA, NORTH CAROLINA,
East Carolina Univ., Greenville. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07245

EROSIONAL AND DEPOSITIONAL ESTUARINE 'TERRACES,' SOUTHEASTERN UNITED STATES,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 2L.
W74-07246

SANTEE SUBMERGENCE, EXAMPLE OF CYCLIC SUBMERGED AND EMERGED SEQUENCES,
South Carolina Univ., Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07247

MARINE GEOLOGY AND ESTUARINE HISTORY OF MOBILE BAY, ALABAMA: PART 1. CONTEMPORARY SEDIMENTS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-07248

EFFECTS OF MAN-MADE WORKS ON THE HYDRAULIC, SALINITY, AND SHOALING REGIMENS OF ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div.
For primary bibliographic entry see Field 5C.
W74-07249

DETERMINATION OF CHLORINATED INSECTICIDES IN SUSPENDED SEDIMENT AND BOTTOM MATERIAL,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W74-07317

AVALANCHE STUDIES (1971-1972),
Washington Univ., Seattle. Geophysics Program; and Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2C.
W74-07319

A NEW LOOK AT RIVER CAPTURE AND AT THE DENUDATION HISTORY OF THE WEALD,
Natural Environment Research Council, London (England). Inst. of Geological Sciences.
B. C. Worssam.
Report No 73/17, 1973. 21 p, 6 fig, 1 tab, 69 ref.

Descriptors: *Erosion, *Geomorphology, *Gradients(Streams), Terraces(Geologic), Terrain analysis, Topography, Slopes, Valleys, Land forming, Quaternary period.
Identifiers: *Great Britain(England).

Terraces in the upper parts of the valleys of the rivers Mole, Wey and Arun, in the western part of the Weald, southeast England, are primarily climatic rather than graded to various Pleistocene sea levels. Many instances of river capture in the Weald, including the well-known case of capture of the Blackwater by the Wey at Farnham, are described. All of them could well have been brought about by a downstream-acting overflow process. The term 'diversion' is preferable to 'river capture' or 'piracy'. The concept of dynamic equilibrium, put forward by J. T. Hack in 1960, provides a simpler explanation of the present topography of the Weald than does the cycle of erosion theory of W. M. Davis. Geological evidence for peneplanation of the Weald appears to be lacking. (Knapp-USGS)
W74-07324

SEDIMENT DISCHARGE IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972 WATER YEAR,
Geological Survey, Menlo Park, Calif.
C. G. Kroll.
Open-file report, September 19, 1973. 33 p, 3 fig, 8 tab, 6 ref, 2 append.

Descriptors: *Sediment discharge, *California, *Sediment yield, *Soil erosion, *Highways, Sampling, Data collections, Runoff, Sediment transport.
Identifiers: *Lake Tahoe(Calif).

Streamflow and fluvial-sediment discharge data are being collected at selected streams and highway gutters in the Lake Tahoe basin to determine the extent of erosion from highway cuts and to evaluate the effects of various land treatment practices to reduce erosion. Precipitation in the Lake Tahoe area during 1972 was 77 percent of normal; consequently, runoff was well below normal. Seventy-six percent of the total annual runoff during the 1972 water year occurred from March through June 1972. Sediment samples were collected during the year at streamflow gaging stations and at gutter stations at highway cuts to define the range of transport conditions. The major part (87 percent) of the annual suspended-sediment discharge during the 1972 water year occurred during the snowmelt runoff period, March through June. (Knapp-USGS)
W74-07326

SIZE AND SHAPE SORTING IN A DUTCH TIDAL INLET,
Groningen Rijksuniversiteit (Netherlands). Geological Inst.
For primary bibliographic entry see Field 2L.
W74-07329

THE RELATIONSHIP OF POROSITY AND ANGLE OF REPOSE TO MIXTURE PROPORTIONS IN ASSEMBLAGES OF DIFFERENT SIZED MATERIALS,
Bristol Univ. (England). Dept. of Geography.
I. Statham.
Sedimentology, Vol 21, No 1, p 149-162, February 1974. 7 fig, 2 tab, 23 ref.

Descriptors: *Porosity, *Sedimentology, *Shear, *Shear strength, Sedimentation, Deposition(Sediments).
Identifiers: Angle of repose(Sediments).

Repose angles of mixtures of glass spheres were studied in rotating drums. Angle of shear is strongly influenced by the proportions of the mixture; it reached a peak value for the minimum porosity mixture. This was attributed to increased dilatation on the shear plane during avalanching. The geomorphic significance of these observations, in terms of slope development, is discussed. Angle of shear, as measured in a rotating drum, is variable, not a true constant, and cannot be exactly analogous to angle of internal sliding friction at constant volume as measured in a shearbox test. It is tentatively suggested that at least some of the variability is attributable to kinetic energy released on failure. (Knapp-USGS)
W74-07330

A SCANNING ELECTRON MICROSCOPE STUDY OF SURFACE TEXTURES OF QUARTZ GRAINS FROM GLACIAL ENVIRONMENTS,
Cambridge Univ. (England). Dept. of Geography.
W. B. Whally, and D. H. Krinsley.
Sedimentology, Vol 21, No 1, p 87-105, February 1974. 15 fig, 1 tab, 30 ref.

Descriptors: *Sediments, *Quartz, Electron microscopy, *Glacial drift, Alluvium, Till, Glaciology, Sedimentology.
Identifiers: *Switzerland(Feegletscher).

Surface textures of quartz sand grains from several glacial environments at the Feegletscher, Switzerland were examined by means of scanning electron microscopy. The difference between supraglacial and subglacial material is very slight. Glacial and extraglacial environments in the vicinity of glaciers are apparently not distinguishable. Examination of surface precipitation features suggests a sequence of events which can be used to help discriminate between different ages of deposits in an area. A similarity between some of the surface debris from moraine samples and those seen in loess and quickclay deposits is also suggested. (Knapp-USGS)
W74-07331

EROSIONAL LOSSES OF S-TRIAZINE HERBICIDES,
Pennsylvania State Univ., University Park. Dept. of Soil Chemistry.
For primary bibliographic entry see Field 5B.
W74-07421

METHYLMERCURY FORMATION IN MERCURY-TREATED RIVER SEDIMENTS DURING IN SITU EQUILIBRATION,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-07425

DISPERSION OF CONTAMINATED SEDIMENT BED LOAD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W74-07446

RELATIONSHIP BETWEEN LOGGING ACTIVITIES AND SALMON PRODUCTION,
Alaska Dept. of Fish and Game, Juneau.
For primary bibliographic entry see Field 4C.
W74-07468

SUPPLY OF TERRIGENOUS MATERIAL TO THE BALTIC SEA (PITANIYE BALTIYSKOGO MORYA TERRIGENNYM MATERIALOM),
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
A. I. Blazhchishin, and Yu. D. Shuyskiy.
Litologiya i Polezyye Iskopayemyye, No 3, p 141-145, May-June 1973. 1 fig, 1 tab, 18 ref.

Descriptors: *Sedimentation, *Deposition(Sediments), *Sediment transport, *Sediment load, *Dissolved solids, Suspended solids, Suspended load, Bed load, Erosion, Beach erosion, Water pollution sources.
Identifiers: *USSR, *Baltic Sea.

The drainage area of the Baltic Sea, including the Lake Ladoga basin, is 1,566,000 sq m or 3.7 times larger than the area of the sea itself. Average annual dissolved-ion discharge into the sea is 46.6 million metric tons, of which 28.1 million metric tons is HCO3, 10.4 million metric tons--Ca, 3.1 million metric tons--SO4, 1.8 million metric tons--Mg, 1.8 million metric tons--Na + K, and 1.4 million metric tons--Cl. Rivers of the basin discharge annually about 3 million metric tons of biogenic elements (SiO2, Fe, P) and 7 million tons of organic matter. The amount of dissolved solids resulting from discharge of groundwater directly into the sea is estimated at 2 million metric tons/yr. In all, 58.6 million metric tons of dissolved material are delivered annually to the sea. The amount of suspended solids is 5.2 million metric tons/yr, of which about 3.5 million metric tons/yr or 67% enters the deep part of the sea. The ratio of alluvial bedload to suspended and dissolved material gives a solids-discharge formula of 1:26:286. This ratio is substantially different from the sediment-discharge formula for the humid zone (1:3:25). The total amount of material obtained by erosion of shores and submarine slopes is presently 24.9-28.2 million metric tons/yr. The total amount of terrigenous material transported to the sea is 90.4 million metric tons/yr. The 58.6 million metric tons of dissolved material delivered annually to the sea reflects the predominance of chemical weathering over mechanical erosion. (Josefson-USGS)
W74-07501

ROLE OF TURBIDITY CURRENTS IN SEDIMENTARY PROCESSES (O ROLI MUT'YEVYKH POTOKOV V PROTSESSAKH OSADKONAKOPLENIYA),
Vsesoyuznyi Geologicheskii Institut, Leningrad (USSR).
S. I. Romanovskiy.
Litologiya i Poleznyye Iskopayemyye, No 3, p 29-37, May-June 1973. 47 ref.

Descriptors: *Turbidity currents, *Sedimentation, Stratification, Geologic time.
Identifiers: USSR, Turbidites, Flysch.

The present status of knowledge of turbidity currents as a physicogeological phenomenon is reviewed, and the role of these currents in sedimentation of past geological epochs is analyzed. Characteristics of the sedimentation mechanism of turbidity currents are described to explain conditions of formation of a number of textural features of turbidites. The problem of recognizing turbidites is discussed, and the possibility of a new approach to the solution of the problem of stratification is investigated in the light of the concept of turbidity currents. (Josefson-USGS)
W74-07502

MECHANISM OF ELEMENT DISTRIBUTION IN THE PACIFIC OCEAN (JAPANESE PROFILE) (K POZNANIYU MEKHANIZMA RASPREDELENIYA ELEMENTOV V TIKHOM OKEANE (YAPONSKIY PROFIL')),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
N. M. Strakhov, I. I. Volkov, and N. A. Lisitsyna.
Litologiya i Poleznyye Iskopayemyye, No 3, p 3-28, May-June 1973. 11 fig, 10 tab, 13 ref.

Descriptors: *Geochemistry, *Trace elements, *Distribution patterns, *Sediments, *Pacific Ocean, Marine biology, Oxidation, Reduction(Chemical), Profiles.
Identifiers: *USSR, Pelagic(Oceanography).

To study the mechanism of element distribution in sediments of the northwestern Pacific, a profile was measured in 1969 during the 46th voyage of the Soviet research vessel 'Vityaz' from Tatar Strait to Wake Island atoll. The total length of the profile was about 4,000 km. Two sharply different mechanisms are evident in the distribution of sedimentary materials on the floor of the ocean basin: the biological mechanism acts in the near-shore zone and governs the distribution of organic C, SiO2, Se, I, and Br; and the mechanical fractionation of allochthonous and autochthonous suspensions governs the distribution and accumulation of Cr, Fe, Ge, V, Al, Ti, Ga, Zr, Nb, Ta, Pb, Zn, As, Cu, Mn, Ni, Co, Mo, P, the rare earths, and probably others, throughout the entire length of the profile. Percentages of the elements increase from the shore to the pelagic zone, while the absolute masses decrease. Percentages of the elements depend on sediment grain size: fine fractions (0.01-0.001 and < 0.001 mm) are the principal carriers of trace elements. The presence of biogenic and mechanical fractionation in the Pacific and other oceans is a function of the enormous size of the ocean basins. (Josefson-USGS)
W74-07503

SUSPENDED-SEDIMENT YIELD IN RIVERS OF GOR'KIY OBLAST AS AN INDICATION OF RECENT EROSION PROCESSES (STOK VZVESHENNYKH NANOSOV V REKAKH GOR'KOVSKOY OBL. KAK POKAZATEL' RAZVITIYA SOVREMENNYKH EROZIONNYKH PROTSESSOV),
Gorkovskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
F. M. Bakanina.
Pochvovedeniye, No 4, p 131-133, April 1973. 3 tab.

Descriptors: *Suspended solids, *Sediment yield, *Sediment discharge, *Streams, *Erosion, Erosion rates, Erosion control, Turbidity.
Identifiers: *USSR(Gor'kiy Oblast).

The largest areas of eroded soils in Gor'kiy Oblast (20%-50%) are concentrated in the Central and Oka-Volga regions on the Volga right bank. Soils in the Sura and Oka-Tesha regions are somewhat less eroded. Soils of the Oblast are eroded mainly by spring melt waters. Turbidity of water in the Alatyr' River increases in spring by a factor of 300. Suspended-sediment yield is greatest in the Alatyr' River (73 metric ton/sq km/yr), considerably less in the P'yana and Sura Rivers (12 and 13 metric tons/sq km/yr) and less than 10 metric tons/sq km/yr in rivers of the northern part of the Oblast. Annual sediment yield is smallest in the Kerzhenets River (2.7 metric tons/sq km/yr) and in the Serezha River (0.56 metric tons/sq km/yr). Over 80% of suspended solids in rivers of the Oblast during floods and low flow is composed of coarse silt, ranging in size from 0.05 to 0.01 mm. Recent erosion processes are most intense in the Alatyr' River basin. Erosion control measures should take into account the rate of development of recent erosion rather than the actual degree of erosion of the area. The erosion rate can be determined from data on suspended sediments discharged by rivers and expressed in metric tons/sq km/yr, and from turbidity indices of river water. (Josefson-USGS)
W74-07507

SOLVENT EXTRACTION OF SULFUR FROM MARINE SEDIMENT AND ITS DETERMINATION BY GAS CHROMATOGRAPHY.
University of Southern California, Los Angeles, Environmental Engineering Program.
For primary bibliographic entry see Field 5A.
W74-07565

2K. Chemical Processes

CHEMICAL AND BIOLOGICAL PROBLEMS IN THE GRAND CANYON,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-07093

MINERALOGICAL COMPOSITION OF CLAYS IN SOIL PROFILES OF ISRAEL: I. THE SOILS OF THE MEDITERRANEAN ZONE,
Hebrew Univ., Rehovot (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2G.
W74-07099

MINERALOGICAL COMPOSITION OF CLAYS IN SOIL PROFILES OF ISRAEL: II. THE SOILS OF THE DESERT ZONE,
Hebrew Univ., Rehovot (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 2G.
W74-07100

QUALITY OF WELL WATERS OF JAIPUR DISTRICT,
Udaipur Univ. (India).
For primary bibliographic entry see Field 4B.

W74-07106

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: I. OBSERVATIONS DURING FLOODING AND DRYING,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 2G.
W74-07151

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: II. OBSERVATIONS DURING THE GROWTH OF COTTON,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 2G.
W74-07152

APPLICATION OF GEOCHEMISTRY TO THE SEARCH FOR CRUDE OIL AND NATURAL GAS,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W74-07161

DISSOLVED-SOLIDS DISCHARGE TO THE OCEANS FROM THE CONTERMINOUS UNITED STATES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-07162

SOURCE AND BUDGET OF SULFATE IN PRECIPITATION FROM CENTRAL ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 5B.
W74-07164

MINERAL SPRINGS IN THE SUEZ RIFT VALLEY--COMPARISON WITH WATERS IN THE JORDAN RIFT VALLEY AND POSTULATION OF A MARINE ORIGIN,
Israel Atomic Energy Commission, Yavne. Soreq Nuclear Research Centre.
E. Mazor, A. Nadler, and M. Molcho.
Journal of Hydrology, Vol 20, No 4, p 289-309, December 1973. 8 fig, 4 tab, 12 ref.

Descriptors: *Water chemistry, *Mineral water, *Springs, Sea water, Chlorides, Sodium, Bromine, Magnesium, Radium radioisotopes, Stable isotopes, Hydrogen sulfide, Carbon radioisotopes, Radioactive dating.
Identifiers: *Israel(Jordon Valley).

Fresh and mineral waters from the eastern margin of the Suez Rift Valley include sources that resemble the mineral waters in the Jordan Rift Valley. They are characterized compositionally by Cl>Na, the presence of NaCl and MgCl2, a Cl/Br ratio around 150, elevated radium and H2S content, elevated temperature, a light stable-isotope composition, and high carbon-14 age. The waters originated from entrapped seawater that gradually changed in composition by interaction with aquifer rocks. Such changes were demonstrated by laboratory experiments. (Knapp-USGS)
W74-07167

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-07176

AQUIFERS IN THE SOKOTO BASIN, NORTHWESTERN NIGERIA, WITH A DESCRIPTION OF THE GENERAL HYDROGEOLOGY OF THE REGION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2F.
W74-07184

INFLUENCE OF MINERAL-WATER REACTIONS IN ESTUARIES ON BORON BUDGET IN THE OCEANS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W74-07227

COMPARISON OF CONDITIONAL STABILITY CONSTANTS OF NORTH CAROLINA HUMIC AND FULVIC ACIDS WITH CO(II) AND FE(III),
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W74-07228

REGIONAL CLAY MINERAL FACIES IN ESTUARIES AND CONTINENTAL MARGIN OF THE UNITED STATES EAST COAST,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 2L.
W74-07237

SOURCE OF RECENT NEARSHORE MARINE CLAYS, SOUTHEASTERN UNITED STATES,
Western Washington State Coll., Bellingham. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W74-07238

TECHNIQUES FOR USE OF ORGANIC AND AMORPHOUS MATERIALS IN SOURCE INVESTIGATIONS OF ESTUARY SEDIMENTS,
For primary bibliographic entry see Field 2L.
W74-07241

PROCESSES AFFECTING GAS DISTRIBUTIONS IN ESTUARINE SEDIMENTS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-07242

TEXTURE AND ORGANIC CARBON CONTENT OF BOTTOM SEDIMENTS IN SOME ESTUARIES OF THE UNITED STATES,
Middlebury Coll., Vt.
For primary bibliographic entry see Field 2L.
W74-07243

BIOGEOCHEMICAL VARIABLES IN BOTTOM SEDIMENTS OF THE RAPPHANNOCK RIVER ESTUARY,
South Carolina Univ., Columbia. Coll. of Arts and Sciences.
For primary bibliographic entry see Field 2L.
W74-07244

EFFECT OF INCREASING DEPTH ON SALINITY IN THE JAMES RIVER ESTUARY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W74-07250

GROUND-WATER RESOURCES OF MCLEAN COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 2F.
W74-07313

PHOTOMETRIC DETERMINATION OF MANGANESE IN WATER BY USING O-TOLIDINE,
Water Management Board, Brno (Czechoslovakia).
J. Maly, and H. Fadrus.
Analyst, Vol 99, No 1175, p 128-136, February 1974. 3 fig, 5 tab, 18 ref.

Descriptors: *Chemical analysis, *Manganese, *Colorimetry, Aqueous solutions, Analytical techniques, Pollutant identification, Oxidation.
Identifiers: Tolidine.

Oxidation products of manganese react with o-tolidine to produce a yellow color, which can be used for the photometric determination of manganese. Prior to the determination, divalent manganese is converted into the higher valency forms by oxidation with atmospheric oxygen in alkaline solution in the presence of magnesium and iron(III) salts. (Knapp-USGS)
W74-07315

TH-234/U-238 ACTIVITY RATIOS IN PACIFIC OCEAN BOTTOM WATERS,
Tata Inst. of Fundamental Research, Bombay (India).
B. S. Amin, S. Krishnaswami, and B. L. K. Somayajulu.
Earth and Planetary Science Letters, Vol 21, No 4, p 342-344, March 1974. 1 tab, 11 ref.

Descriptors: *Water chemistry, *Pacific Ocean, *Uranium radioisotopes, *Sea water, Sampling, Radioisotopes, Heavy metals, Chemical precipitation.
Identifiers: *Thorium.

Th-234/U-238 activity ratios in the near-bottom waters at a station in the South Pacific are close to the secular equilibrium value, ranging between 0.9 and 1.13 (plus or minus 8%). This suggests that the rate of removal of Th-234 by bottom-water scavenging processes is slow compared to its rate of radioactive decay. The mean activity ratio in these waters is 1.14 plus or minus 0.02, the same as the reported values for the world oceans. (Knapp-USGS)
W74-07322

STUDIES OF THE INGREDIENTS VARIATION OF THE SAKE-GAWA RIVER, A TRIBUTARY OF THE MOGAMI RIVER (IN JAPANESE),
Yamagata Prefectural School for the Blind, Kaminoyama (Japan).
N. Aita.
Jap J Limnol. Vol 33, No 2, p 11-15. 1972. Illus. (English summary).
Identifiers: Alkalinity, *Calcium, *Chlorides, Flow, Ingredients, *Japan(Mogami river basin), Rivers, Tributaries, Thaw.

As is usual in the snowy districts, the melting snow in spring causes the rise of river water. In the Sake-gawa River (Japan) a thaw usually begins early in March and continues for about 3 mo. Judging from the variations of its flow rate, the snow-thawing season is divided into 3 stages. Throughout the thawing season, the concentrations of Cl and Ca ions are kept rather high in spite of the large flow rate. Different from the ions, the alkalinity is negatively correlated with the logarithm of the flow rate at the same period. The observations of the concentration of dissolved mineral show that the amount of transportation (Qd) is proportional to the 'n'th power of the flow rate (Q), i.e., Qd = aQn, where 'n' are the constants dependent on the ions and the stage of snow thawing. In the case of chloride ion, the value of 'n' is in the following order: the beginning > the middle stage = the end. At the beginning stage, the atmospheric salt in the fallen snow conveyed by the monsoon in winter is transported rapidly in the river water. As for the Ca ion, the value of 'n' is in the order: the beginning > the end > the middle stage. The total amount of transported Cl ion during the snow-thawing season is about a half of the yearly amount. The same is true of the Ca ion.--Copyright 1973, Biological Abstracts, Inc.
W74-07360

STRONTIUM AND OTHER NOTABLE CHEMICAL CONSTITUENTS OF WELL-WATER OF ALLEN COUNTY, INDIANA,
Geological Survey, Bloomington, Ind.
C. F. Foley, N. K. Bleuer, R. K. Leininger, and W. C. Herring.
Proceedings of the Indiana Academy of Science, Vol 82, p 274-280, 1972. 3 fig, 1 tab, 10 ref.

Descriptors: Aquifer characteristics, Glacial aquifers, Soil water, Bedrock, *Indiana, Hydrologic data, Geomorphology, Stratigraphy, *Water chemistry, *Groundwater, *Strontium, *Iron, *Sulfates, Solutes, Metals, Cations, Anions, Dolomite, Glacial sediments, Pyrite, Shales, Alkalinity, Bicarbonates, Magnesium, Hardness(Water), Calcium, Glaciohydrology.
Identifiers: Allen County(Ind).

Fourteen waters from aquifers in glacial deposits and 31 samples from aquifers in bedrock were obtained for a water quality study of Allen County, Indiana. Glacial waters contained relatively high concentrations of Fe, Sr, and sulfate. The Fe probably derived from pyrite in Antrim Shale particles. The Ca/Mg ratio decreased generally from north to south and may reflect southward increasing dolomite contents of glacial deposits. Bedrock waters contained much less Fe, but generally more Sr and sulfate. Total solids, sulfate, Sr, bicarbonate alkalinity, water hardness, and the ratio of Sr atoms/1000 Ca atoms increased from NW to SE. Areal distributions of these constituents reflect relationships with bedrock stratigraphy and groundwater flow. (Brown-IPC)
W74-07400

QUANTITATIVE CHEMICAL ANALYSIS OF SPECIFIC COMPONENTS OF THE WATERS OF LOST CREEK AND THE WABASH RIVER, VIGO COUNTY, INDIANA,
Indiana State Univ., Terre Haute. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-07405

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF NATURAL WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
P. Foster, and A. W. Morris.
Water Research, Vol 8, No 3, p 137-142, March 1974. 7 fig, 1 tab, 5 ref.

Descriptors: *Salinity, *Ultraviolet radiation, *Tracking techniques, Sea water, Runoff, *Organic matter, Tracers, Path of pollutants, Remote sensing, *Absorption.

Concurrent measurements of salinity and u.v. absorbance at selected wavelengths were made on waters collected from an inshore sea area subject to the influence of a number of sources of land drainage. An inverse relationship was found between salinity and absorbance in the spectral region 250-350 nm. As a result of the difference in the absorbance and variations in the relative absorbance in different spectral regions of the fresh water sources, various water masses could be distinguished in the sea. (Knapp-USGS)
W74-07419

THE CHEMISTRY OF CADMIUM IN NATURAL WATER--II. THE ADSORPTION OF CADMIUM ON RIVER MUDS AND NATURALLY OCCURRING SOLIDS,
Stevenage (England). Water Pollution Research Lab.
J. Gardiner.
Water Research, Vol 8, No 3, p 157-164, March 1974. 3 fig, 7 tab, 17 ref.

Descriptors: *Cadmium, *Mud, *Adsorption, Path of pollutants, Rivers, Chelation, Sorption, Humic acids, *Organic matter, Water chemistry, Water quality.

The adsorption of cadmium on mud solids and particles of clay, silica, humic material and other naturally occurring solids was studied using radiochemical methods. Cadmium concentrations in the range of micrograms per liter could be used. The variation of the extent of adsorption with many of the large number of factors involved was investigated and concentration factors (distribution coefficients) were determined. Rates of adsorption and desorption were rapid. Concentration factors for river muds varied between 5000 and 50,000 and depended mainly on the type of solid, its state of subdivision, the concentration of metal ion present, the time of contact and the concentration of complexing ligands. Humic material appeared to be the main component of river mud responsible for adsorption. Adsorption and desorption processes are major factors in controlling the concentration of cadmium in natural waters and tend to counteract changes in the concentration of the metal ion in solution. (See also W74-03775) (Knapp-USGS)
W74-07420

PUBLIC GROUNDWATER SUPPLIES IN BOND COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4B.
W74-07429

MICRO-DETERMINATION OF CATION-EXCHANGE CAPACITY BY NEUTRON ACTIVATION ANALYSIS,
Oregon Agricultural Experiment Station, Corvallis.
For primary bibliographic entry see Field 2G.
W74-07439

DETERMINATION OF NITRATES IN SOIL EXTRACTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-07443

MINERAL SPRINGS IN THE SUEZ RIFT VALLEY - COMPARISON WITH WATERS IN THE JORDAN RIFT VALLEY AND POSTULATION OF A MARINE ORIGIN,
Israel Atomic Energy Commission, Yavne. Soreq. Nuclear Research Center.
E. Mazor, A. Nadler, and M. Molcho.
Journal of Hydrology, Vol 20, No 4, p 289-309, December, 1973. 8 fig, 4 tab, 15 ref.

Descriptors: *Water quality, *Water types, Water analysis, Water chemistry, Water pollution sources.
Identifiers: *Red Sea Rift.

Fresh and mineral waters from the eastern margin of the Suez Rift Valley are described. They include a fair number of sources that resemble the mineral waters in the Jordan Rift Valley. The term Tiberias-Farun water is thus suggested to describe them. They are characterized compositionally by Cl>Na, the presence of NaCl and MgC12, a Cl/Br ratio around 150, elevated radium and H2S content, elevated temperature, a light stable-isotope composition and high carbon-14 age. The Tiberias-Farun waters are suggested to have originated from entrapped seawater that gradually changed in composition by interaction with aquifer rocks. Such changes were demonstrated to take place in the laboratory experiments. (Skogerboe-Colorado State)
W74-07444

MECHANISM OF ELEMENT DISTRIBUTION IN THE PACIFIC OCEAN (JAPANESE PROFILE) (K POZNANIYU MEKHANIZMA RASPREDELENIYA ELEMENTOV V TIKHOM OKEANE (YAPONSKIY PROFIL')),
Akademiya Nauk SSSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 2J.
W74-07503

BROMINE IN GROUNDWATER OF UZBEKISTAN (BROM V PODZEMNYKH VODAKH UZBEKISTANA),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
L. A. Kalabugin.
Uzbekskiy Geologicheskiy Zhurnal, No 6, p 30-32, 1972.

Descriptors: *Geochemistry, *Water chemistry, *Bromine, *Groundwater basins, Geologic time, Brines, Salinity.
Identifiers: *USSR(Uzbek SSR), Mineralization.

Groundwater with a high bromine content was discovered in Uzbekistan on the Ustyurt Plateau, in lower reaches of the Amudar'ya River, and in the Bukhara-Karshi, Surkhandar'inskiy and Fergana artesian basins. Stratigraphically, these waters are confined to Permian-Triassic, Jurassic, Cretaceous, and Paleocene deposits. The chemical composition of the waters is of the sodium- and calcium-chloride types, being weak to strong brines. The pH of the waters ranges from mildly acidic to neutral. The waters are metamorphosed and belong principally to waters derived from residual brine of marine lakes in the absence of water exchange with the ground surface. The bromine content in water increases down valley and with increasing mineralization. Bromine may originate from the destruction of bromine-organic compounds at high temperatures and pressure. (Josefson-USGS)
W74-07505

THE INFLUENCE OF GEOLOGICAL MEMBRANES ON THE GEOCHEMISTRY OF SUBSURFACE WATERS FROM MIOCENE SEDIMENTS AT KETTLEMAN NORTH DOME IN CALIFORNIA,
California Univ., Berkeley. Dept. of Geology and Geophysics.
Y. K. Kharaka, and F. A. F. Berry.
Water Resources Research, Vol 10, No 2, p 313-327, April 1974. 11 fig, 3 tab, 40 ref. NSF Grant GS 1371.

Descriptors: *Water chemistry, *Oil fields, *Membrane processes, Geochemistry, *California, Water temperature, Sodium, Ammonia, Magnesium, Calcium, Strontium, Chlorides, Sulfates, Iodine, Bromine, Silica, Ion exchange, Clays, Zeolites, Shales.
Identifiers: Kettleman Hills(Calif), Lithium, Rubidium, Barium.

In the Kettleman North Dome oilfield in California, the waters from the Temblor formation (Miocene) are principally meteoric in origin, related to recharge areas located to the west. Their chemistry relative to meteoric water is attributed to hyperfiltration through geological membranes as well as to water-rock interactions. The chemistry of the waters in each subzone of the Temblor formation is characteristic of that subzone and shows membrane effluent characteristics to a given subzone with respect to the one stratigraphically below it. The chemical relations are attributed to increased efficiency of shale membranes with increased depth of burial. Membrane behavior of shales controls completely or in part the distribution of the following ratios: Li/Na, Rb/Na, NH3/Na, Mg/Ca, Sr/Ca, Ca/Na, alkalinity/Cl, SO4/Cl, I/Br, and B/Cl. Some of these ratios are modified by temperature-controlled water-rock interactions. The K/Na ratios and the SiO2 and Ba concentrations are completely dependent on water-rock interactions. (Knapp-USGS)
W74-07513

AN EXPERIMENTAL STUDY OF IMMISCIBLE DISPLACEMENT WITH AN UNFAVORABLE MOBILITY RATIO IN POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
For primary bibliographic entry see Field 2F.
W74-07524

DISTRIBUTION AND CHEMISTRY OF PHOSPHORUS IN AN ALBAQUALF SOIL AFTER 82 YEARS OF PHOSPHATE FERTILIZATION,
Missouri Agricultural Experiment Station, Columbia.
For primary bibliographic entry see Field 5B.
W74-07532

ROTATING RING-DISK ELECTRODE STUDY OF THE ADSORPTION OF LEAD ON GOLD IN 0.5M POTASSIUM CHLORIDE,
State Univ. of New York, Buffalo. Dept. of Chemistry.
V. A. Vicente, and S. Bruckenstein.
Analytical Chemistry, Vol 45, No 12, p 2036-2043, October 1973. 10 fig, 4 tab, 27 ref.

Descriptors: *Adsorption, *Lead, *Electrochemistry, Zeta potential, Heavy metals, Ions, Oxidation, Chlorides, *Electrodes.
Identifiers: Rotating ring-disk electrodes, *Gold electrodes, Cyclic voltammetry, Anodic stripping voltammetry, Chemical concentration, Chemical interference, Ion selective electrodes, Desorption, Potassium chloride.

The underpotential deposition of Pb(0) on gold occurred at OV greater than E sub D greater than minus 0.6V (SCE) using cyclic voltammetry at a rotating gold ring-disk electrode. A complete monolayer of Pb atoms on gold is equivalent at 420 microC/geometric sq cm or about 247 microC/real sq cm. Bulk Pb(0) deposition does not occur until this amount of charge has been consumed. The monolayer of underpotential Pb(0) yields three peaks upon anodic stripping. Further, adsorption of Pb(II) on gold occurs during the cathodic disk potential scan and begins at about plus 0.6V. From ring collection data, about 20 percent of a monolayer equivalent remains absorbed at the disk as a lead(II) species during the anodic disk potential scan. Complete desorption occurs just before the potential for the dissolution of gold (E sub D equivalent or equal to plus 0.7V) in the chloride medium. (Holoman-Battelle)
W74-07555

MASS AND CHARGE TRANSFER KINETICS AND COULOMETRIC CURRENT EFFICIENCIES. PART VII. CONDITIONAL POTENTIALS, AND SINGLE-SCAN VOLTAMMETRY OF PURE VANADIUM(V) - VANADIUM(IV) SYSTEMS IN VARIOUS MEDIA AT PLATINUM ELEC TRODES PRE-TREATED BY FIVE METHODS,
Exeter Univ. (England). Dept. of Chemistry.
E. Bishop, and P. H. Hitchcock.
Analyst, Vol 98, No 1169, p 553-562, August 1973. 6 fig, 26 ref.

Descriptors: *Kinetics, Chemical reactions, Hydrogen ion concentration, Electrochemistry, Electrolytes, Heavy metals, Aqueous solutions, Oxidation, Electric currents, Efficiencies, Zeta potential.
Identifiers: *Vanadium, *Mass transfer, *Charge transfer, *Single scan voltammetry, *Platinum electrodes, Coulometric currents, Pretreatment methods, Electrochemical reactions, Voltammetry, Isopolymerization reactions, Ion selective electrodes.

The limited previous work on vanadium is reviewed. Five methods of electrode pre-treatment have been selected and are described. The variation of the conditional potential of the vanadium(V) - vanadium(IV) system with hydrogen-ion concentration is reported. The experimental work is complicated by isopolymerization reactions, of which at least one is kinetically slow. The voltammetric reduction of vanadium(V) in saturated potassium sulphate - acetate buffer at pH 4.0 is examined: the benefit of shifting solvent reaction potentials to more negative potentials is nullified by the direct reduction of un-ionized acetic acid. A similar examination is made in a medium of 0.00001 M sulphuric acid and in one of 2.0 M sulphuric acid. Possible adsorption effects are canvassed. The comples behavior at intermediate hydrogen-ion concentrations is discussed, with illustrations drawn from a sulphuric acid medium of pH 2.0. The anodic oxidation of vanadium(IV) is briefly examined. It is concluded that the electrochemical behavior of the vanadium system is strongly dependent on hydrogen-ion concentration and on the electrode pre-treatment. The electrode can be chemically oxidized in vanadium(V) solutions. The mechanism is a one-step one-electron process. No evidence could be found for reduction below the plus 4 oxidation state at platinum. Vanadium(IV) cannot be oxidized without severe loss of current efficiency, nor reduced to vanadium(III) at platinum electrodes. (See also W74-07558) (Holoman-Battelle)
W74-07557

A NEW COLORIMETRIC PROCEDURE FOR THE DETERMINATION OF BENOMYL,
Norges Landbrukshoegskole, Vollebekk. Chemical Research Lab.
For primary bibliographic entry see Field 5A.
W74-07559

KAEMPFEROL (3,5,7,4'-TETRAHYDROXYFLAVONE) AS A CHROMOGENIC REAGENT FOR TIN(IV),
Delhi Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-07579

ELEMENTAL VARIABILITY WITHIN A SAMPLING UNIT,
Ohio Agricultural Research and Development Center, Wooster.
L. R. Drees, and L. P. Wilding.
Soil Sci Soc Am Proc. Vol 37, No 1, p 82-87, 1973. Illus.
Identifiers: *Sampling, *Spectroscopy(X-ray), Variability, *Trace elements.

To determine the magnitude of lateral variability within an area of 1-2 m2, 6 profiles were sampled at 0.6 m-intervals at each of 3 different sites representing loess, till and outwash deposits. Elemental Ti, Zr, Fe, Ca, and K were determined by X-ray spectroscopy for 50-20 micron and 2-5 micron fractions of selected horizons within each profile. Coefficients of variation within these deposits ranged from 1-13% for Ti, 4-20% for Zr, 3-20% for Fe, 5-13% for Ca, and 2-9% for K. The order of variability was loess less than or equal to till < outwash. No consistent differences in elemental variability were observed between size fractions or horizons (i.e., A, B, or C). Elemental data from a single horizon within a vertical profile will seldom permit mean estimates closer than plus or minus 10-20% (95% confidence interval) for loess and till deposits, and plus or minus 20-45% for the more variable outwash deposits. Three lateral subsamples within a given horizon would permit mean estimates of above elements within plus or minus in loess and till but 20 subsamples would be required to achieve similar accuracies in some outwash deposits. Such data emphasize the need to multiply subsample horizons in a lateral dimension if mean estimates are to be accurate within 10-20% over an area approximating a pedon or sampling pit. The number of subsamples for a given horizon is a function of the element under consideration, nature of deposit, and precision of mean estimate desired.--Copyright 1973, Biological Abstracts, Inc.
W74-07598

2L. Estuaries

TECHNOLOGY TRANSFER IN THE MARINE ENVIRONMENT OF LONG ISLAND,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W74-07059

PROGRAM DEVELOPMENT PLAN FOR THE MESA-NEW YORK BIGHT REGIONAL PROJECT.
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 6B.
W74-07078

SEDIMENTATION BY NON-TIDAL CURRENTS AROUND NORTHERN DENMARK,
Institute of Oceanographic Sciences, Wormley (England).
A. H. Stride, and W. D. Chesterman.
Marine Geology, Vol 15, No 5, p M53-M58, December 1973. 2 fig, 8 ref.

Descriptors: *Sedimentation, *Bottom sediments, *Continental shelf, Sounding, Sand waves, Currents(Water), Littoral drift, Ocean currents, Europe.
Identifiers: *Denmark.

On the shallow sea floor off northern Denmark, a number of bedforms of mobile sand can be associated with nearby sand deposits. Both appear to have been formed largely by the strong, wind-induced, intermittent, coastal current, which converges from between west and south, and flows eastward past the north Danish coast. (Knapp-USGS)
W74-07160

DISSOLVED-SOLIDS DISCHARGE TO THE OCEANS FROM THE CONTERMINOUS UNITED STATES,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-07162

REMANENT MAGNETIZATION OF MODERN TIDAL FLAT SEDIMENTS FROM SAN FRANCISCO BAY, CALIFORNIA,
Stanford Univ., Calif. Dept. of Geology.
S. Graham.
Geology, Vol 2, No 5, p 223-226, May 1974. 7 fig, 1 tab, 15 ref.

Descriptors: *Bottom sediments, *Mud flats, *California, *Magnetic studies, Sedimentology, Sedimentation, Deposition(Sediments), Sampling, Bottom sampling.
Identifiers: *Tidal flats, *San Francisco Bay, Bioturbation.

Sediments from mud flats of the upper bare zone of San Francisco Bay, California, tidal flats possess remanent magnetization uniform in intensity and direction. The uniformity of magnetization and considerations of the stability of iron species in low Eh, low pS environments (reducing marine conditions) indicate that the remanent magnetization is not chemical remanent magnetization. The pervasiveness of bioturbation in the tidal flat setting, a lack of inclination errors, and the consistent north-directed magnetization acquired by experimentally slurried bay sediment (simulating bioturbation) suggest that the remanent magnetization is postdetrital remanent magnetization related to bioturbation of wet tidal flat sediments. (Knapp-USGS)
W74-07173

ENVIRONMENTAL FRAMEWORK OF COASTAL PLAIN ESTUARIES.
Proceedings of Symposium on Estuaries, 18th Annual Meeting of the Southeastern Section of Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, B. W. Nelson, editor, 1972. 619 p.

Descriptors: *Estuaries, *Sedimentation, *Water pollution effects, Deposition(Sediments), Erosion, Sediment transport, Water chemistry, Water circulation, Coastal plains.

Estuarine water circulation, sedimentation, and water pollution are discussed in this collection of symposium papers. Water circulation patterns are the principal control of sedimentation and are the factor most commonly modified by man's activity. Pollution is common in estuaries because they are the sites of many of the world's major cities. (See W74-07226 thru W74-07250) (Knapp-USGS)
W74-07225

RECENT INVESTIGATIONS IN STRATIFIED FLOWS RELATED TO ESTUARIAL HYDRAULICS,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
E. Partheniades.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 29-70, 1972. 24 fig, 1 tab, 23 ref.

Descriptors: *Mixing, *Stratified flow, *Estuaries, *Saline water intrusion, Hydraulics, Streamflow, Tides, Turbulence, Diffusion, Dispersion, Equations, Reviews.

Equations are available for flow in fully stratified, partially and well-mixed estuaries. The analytical solutions, mostly one-dimensional to date, are very useful in predicting the effects of changes in the estuary regime on salinity intrusion and shoaling patterns. Stratified estuaries have a discontinuous interface between saltwater and freshwater across which very little mixing occurs. In channels, unbalanced downstream pressure forces near the freshwater end overcome the frictional resistance at the interface and contribute to an increase of the velocity head; at the saltwater end an unbalanced pressure force drives saltwater upstream near the bottom. Analytical expressions exist for interfacial stability, mixing, and interfacial and bed shear stresses. The hydraulic equations predict increase in the saltwater intrusion length with increase of channel depth or decrease of freshwater flow. In real estuaries, tides generate shearing stresses that break the interface and mix saltwater and freshwater. Mixing increases with increasing tidal amplitude and decreasing freshwater flow. Continuous entrainment, mixing, upstream and downstream saltwater movement induce a net upstream flow of saltwater near the bottom, just as in the fully stratified case, when the average transport over a tidal period is considered. Mixing is a complex combination of turbulent eddy diffusion, longitudinal dispersion, and gravitational convection. The diffusion coefficient depends on the rate of dissipation of energy due to tidal forces and the degree of vertical mixing. Vertical mixing usually is downward in the first half of the intrusion length but upward in the second half and depends on the degree of stratification. (See also W74-07225) (Knapp-USGS)
W74-07226

INFLUENCE OF MINERAL-WATER REACTIONS IN ESTUARIES ON BORON BUDGET IN THE OCEANS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
R. C. Harriss.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 71-77, 1972. 1 tab, 39 ref.

Descriptors: *Water chemistry, *Estuaries, *Boron, Salinity, Sea water, Water balance, Mineralogy, Sedimentation, Adsorption, Chemical precipitation.

A quantitative mass balance calculation indicates that mineral-water reactions in estuaries are the primary control on the boron content of seawater. The total annual removal of boron from the oceanic reservoir by mineral-water reactions and biogenic sedimentation is approximately equal to the total annual influx of boron in continental drainage, indicating that under present conditions the boron content of seawater is about constant with time. Because the buffer system controlling the boron content of seawater is independent of buffer systems controlling most other elemental concentrations in seawater, a constant boron-salinity relation over long periods of geologic time cannot be expected. (See also W74-07225) (Knapp-USGS)
W74-07227

COMPARISON OF CONDITIONAL STABILITY CONSTANTS OF NORTH CAROLINA HUMIC AND FULVIC ACIDS WITH CO(II) AND FE(III),
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W74-07228

AMAZON RIVER ESTUARINE SYSTEM,
Northwestern Univ., Evanston, Ill. Dept. of Geology.
R. J. Gibbs.
In: Environmental Framework of Coastal Plain Estuaries, 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 85-88, 1972. 2 fig, 1 tab, 2 ref.

Descriptors: *Estuaries, *Mixing, *Stratified flow, Saline water intrusion, Water circulation, Density stratification.
Identifiers: *Amazon River.

Results of preliminary survey of the water circulation in the Amazon estuary during high river and low river discharge indicate that, due to the river's large discharge, no saltwater wedge enters the Amazon estuary. Rather, an area of turbulent mixing near the river mouth is indicated by a zone a nearly vertical isohalines. As the vertical mixing decreases seaward, vertical stratification develops offshore, persisting seaward across the continental shelf. (See also W74-07225) (Knapp-USGS)
W74-07229

BIODEPOSITION AS A FACTOR IN SEDIMENTATION OF FINE SUSPENDED SOLIDS IN ESTUARIES,
Virginia Inst. of Marine Science, Gloucester Point.
D. S. Haven, and R. Morales-Alamo.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc., Memoir 133, p 121-130, 1972. 6 fig, 1 tab, 16 ref. AEC Grant AT-(40-1)-2789.

Descriptors: *Deposition(Sediments), *Sedimentation, *Estuaries, Sedimentology, Benthos, Settling velocity, Suspended load.
Identifiers: Biodeposition(Sediments).

Filter feeders, such as mollusks, tunicates, and barnacles, ingest particles as small as 1 micron during their feeding process and void them in fecal pellets which range from 500 to 3,000 microns in length; these pellets settle at a much faster rate than their component particles. Oyster biodeposits contain 77% to 91% inorganic matter, 4% to 12% organic carbon, and about 1.0 gram per kilogram of phosphorus. Fecal pellets are alternately deposited and resuspended by tidal currents. They settle and accumulate in areas of estuaries where the fine particles themselves would not. A portion of the biodeposits settling on sediment surfaces is mixed into subsurface deposits and may alter the textural and chemical properties of the original sediments. (See also W74-07225) (Knapp-USGS)
W74-07231

SPATIAL AND TEMPORAL DISTRIBUTION OF SUSPENDED SEDIMENT IN NARRAGANSETT BAY AND RHODE ISLAND SOUND,
Naval Underwater Systems Center, Newport, R.I.
R. W. Morton.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc, Memoir 133, p 131-141, 1972. 7 fig, 5 ref.

Descriptors: *Sediment load, *Suspended load, *Sedimentation, *Estuaries, Rhode Island, Distribution patterns, Sedimentation rates.
Identifiers: *Narragansett Bay(R.I.), Rhode Island Sound.

The suspended sediment concentrations in Narragansett Bay and Rhode Island Sound were measured using a continuous-flow centrifuge. Average concentrations were 3.17 milligrams of sediment per liter in the Bay and 1.83 milligrams per liter in the Sound. Most of the sediment entering the estuary from the tributaries is deposited near the head of the Bay, but there is a secondary depositional area near the center of the Bay in zones of weak and variable currents. The average rate of deposition for the entire bay during the fall months was 0.092 grams per square centimeter per year, and the net transport through the estuary was 10% of the tributary sediment load, or 910 grams per second. (See also W74-07225) (Knapp-USGS)
W74-07232

SUSPENDED SEDIMENT TRANSPORT IN DELAWARE BAY,
Millersville State Coll., Pa.
B. L. Oostdam, and R. R. Jordan.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC; Geological Society of America, Inc, Memoir 133, p 143-149, 1972. 4 fig, 17 ref.

Descriptors: *Sediment transport, *Suspended load, *Estuaries, Currents(water), Advection, Sampling, Tides, Water circulation.
Identifiers: *Delaware Bay.

Sverdrup's simple advective model of estuarine circulation is extended to include suspended sediment transport. Substitution of average flow and turbidity figures suggests a net landward suspended sediment transport into Delaware Bay near the bottom. The resulting projected sedimentation rate of 15 cm per century corresponds reasonably well with figures for the regional relative sea-level rise. In the Delaware Bay mouth, two stations located in fingerlike channels near both shores show net landward sediment transport over a tidal cycle at almost all depths, whereas a station near the center of the bay mouth displays net seaward transport at all levels. (See also W74-07225) (Knapp-USGS)
W74-07233

DISTRIBUTION AND TRANSPORTATION OF SUSPENDED SEDIMENT IN UPPER CHEASAPEAKE BAY,
Johns Hopkins Univ. Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc, Memoir 133, p 151-167, 1972. 12 fig, 17 ref.

Descriptors: *Sedimentation, *Sediment transport, *Estuaries, *Chesapeake Bay, Suspended load, Water circulation, Streamflow, Floods, Peak discharge, Distribution patterns.
Identifiers: *Susquehanna River.

In the upper reaches of the Chesapeake Bay there occur two distinctive distributions of suspended sediment and associated patterns of sediment transport. During the spring freshet the Susquehanna River overpowers the characteristic nontidal estuarine circulation in the upper 20 to 30 kilometers of the estuary, and the net flow and sediment transport are seaward at all depths. The marked decrease seaward of the concentration of suspended sediment in the upper bay reveals the close link, during the freshet, between the suspended sediment and the principal ultimate source of sediment--the Susquehanna River. With subsiding river flow the net nontidal estuarine circulation is reestablished in the upper bay, and a turbidity maximum is formed. The high concentrations of suspended sediment, greater than those either farther upstream in the source river or farther seaward in the estuary, are produced and maintained primarily by the periodic resuspension of bottom sediment by tidal scour and by the sediment trap created in the upper reaches of the estuarine circulation regime. (See also W74-07225) (Knapp-USGS)
W74-07234

RIO DE LA PLATA ESTUARY ENVIRONMENTS,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
C. M. Urien.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 213-234, 1972. 10 fig, 4 tab, 12 ref.

Descriptors: *Estuaries, *Sedimentation, Currents(Water), Water circulation, Sediment transport, Beaches, Sands, Silts.
Identifiers: *Argentina(Rio de la Plata).

The Rio de la Plata is an estuary 220 km long and 35 to 230 km wide in Argentina. The upper river has a freshwater invironment where the Uruguay and Parana River systems converge. The Parana River is building a delta in the upper Rio de la Plata. The hydraulic system has an average yearly discharge of 25,000 cu m per sec. The mouth of this estuary is open to the sea. Because the tide, tidal currents, wind, and waves affect the fluvial discharge, the river flow is not continuous. Apparently the saltwater influence on sedimentation is less than that of dynamic action. Over the estuary bottom lie silty sand and silty clay. The river sediment supply consists mainly of silt and clay. In the upper estuary the sand is scarce and localized to banks, bars, and beaches. In the outer estuary a sand carpet extends from the inner continental shelf into the estuary. These are relict sands of the last Holocene transgression which invaded the estuary between 7,000 and 3,000 years B.P. After Holocene time fluvial mud facies covered, in part, the transgressive sands. The south coastal environment is estuarine, with its maximum development in Samborombon Bay. The north coast is rocky and sandy with pocket beaches. The regional estuarine environment is mostly fluvial, but the mixing of ocean waters creates a gradual change from fluvial in the upper river to fluviomarine and marine in the outer river. (See also W74-07225) (Knapp-USGS)
W74-07236

REGIONAL CLAY MINERAL FACIES IN ESTUARIES AND CONTINENTAL MARGIN OF THE UNITED STATES EAST COAST,
Geological Survey, Woods Hole, Mass.
J. C. Hathaway.
In: Environmental Framework of Coastal Plain Esutaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 293-316, 1972. 14 fig, 31 ref.

Descriptors: *Sedimentation, *Estuaries, *Provenance, *Atlantic Coastal Plain, *Clay minerals, Clays, Kaolinite, Illite, Mineralogy, Sediment transport, Facies(Sedimentation), Southeast U.S., Northeast U.S.

The clay minerals in many estuaries of the eastern United States differ from these in the sediments of the rivers that feed these estuaries. Illite and chlorite are characteristic minerals of the estuaries as far south as Chesapeake Bay, yet chlorite is minor and illite is reduced in concentration in the rivers south of the Hudson. Dioctahedral vermiculite is common in river sediments along the entire coast, yet it is important in estuarine sediments only in Pamlico Sound and the Neuse River estuary, North Carolina. Two major clay mineral facies are observed in the estuaries and on the continental margin: a northern facies characterized by illite, chlorite, and traces of feldspar and hornblende, and a southern facies characterized by montmorillonite and kaolinite. The similarity in composition between Chesapeake Bay and the estuaries to the north may be the result of reworking and redeposition of sediments contributed during Pleistocene time, inasmuch as the Chesapeake is the southermost estuary fed by rivers that drained glaciated areas. Shoreline erosion and reworking of still older sediments on the shelf probably also contribute clay to the estuarine sediments. Bottom drift directions suggest that clay material is moved southward along the shelf and into the mouths of the estuaries; there tidal mixing homogenizes the clay mineral composition over large areas. (See also W74-07225) (Knapp-USGS)
W74-07237

SOURCE OF RECENT NEARSHORE MARINE CLAYS, SOUTHEASTERN UNITED STATES,
Western Washington State Coll., Bellingham. Dept. of Geology.
D. R. Pevear.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 317-335, 1972. 14 fig, 38 ref.

Descriptors: *Sedimentation, *Estuaries, *Provenance, *Atlantic Coastal Plain, *Clay minerals, Clays, Kaolinite, Illite, Mineralogy, Sediment transport, Facies(Sedimentation), *Southeast U.S.

Clays in the fine fraction of nearshore marine sediments from the southeastern United States are mineralogically different from clays from the rivers which drain into nearshore areas. River clays average 60% kaolinite with vermiculite nest in abundance, and illite, chlorite, and montmorillonite present in minor amounts. The main source of river clay must be the weathered feldspathic metamorphic rocks of the Piedmont. Small rivers which rise in the Coastal Plain carry montmorillonite and kaolinite, but their quantitative contribution to nearshore areas is very small. Nearshore marine clays of Florida, Georgia, and South Carolina average 50% montmorillonite, whereas those of North Carolina contain both illite and montmorillonite in abundance. A significant part of the nearshore clays must, therefore, come from nonriver sources. Shelf clays are montmorillonitic except off North Carolina where they are illitic as well. Hence, some nearshore clays may be derived either from the shelf or perhaps from erosion of coastal Pleistocence outcrops. Some illitic clay may be transported southward to North Carolina from shore and shelf areas to the north, but this mechanism appears not to operate south of North Carolina. River vermiculite may absorb potassium in the marine environment and collapse to illite. (See also W74-07225) (Knapp-USGS)
W74-07238

MASS PHYSICAL AND ENGINEERING PROPERTIES OF SOME YORK RIVER SEDIMENTS,
Lafayette Coll., Easton, Pa. Dept. of Geology.
R. W. Faas.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 337-347, 1972. 4 fig, 4 tab, 14 ref. NSF Grant GY-4092.

Descriptors: *Sedimentology, *Soil strength, *Bottom sediments, *Virginia, *Estuaries, Silts, Clay, Sands, Mechanical properties, Shear strength.
Identifiers: *York River(Va).

In two 232-square-meter areas of the bottom sediments of the York River, Yorktown, Virginia, sediments found in 9 meters of water were clayey silts and those at 4 meters were silty and clayey sands. Some representative ranges for mass properties of the clayey silts are: buld (wet) density, 1,41 to 1.23; moisture content, 222% to 144%; porosity, 85% to 79%. For the silty and clayey sands, the same properties are bulk (wet) density, 2.43 to 1.27; moisture content, 97% to 49%; and porosity, 71% to 56%. In situ strength is consistently higher and has lesser variability than laboratory strength. Disturbance of the sedimentary fabric due to coring is believed responsible. (See also W74-07225) (Knapp-USGS)
W74-07239

STRONTIUM ISOTOPE COMPOSITION AND SEDIMENT TRANSPORT IN THE RIO DE LA PLATA ESTUARY,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
P. E. Biscaye.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc, Memoir 133, p 349-357, 1972. 3 fig, 1 tab, 11 ref. AEC contract AT (30-1) 4055.

Descriptors: *Tracers, *Strontium radiosotopes, *Sedimentology, *Estuaries, Sedimentation, Sediment sorting, Provenance, Sediment transport, Particle size.
Identifiers: Rubidium, *Argentina(Rio del la Plata estuary).

Rubidium, strontium, and strontium isotope composition were analyzed on a suite of whole, surface-sediment, carbonate-free samples from the Plata estuary, its major source rivers and the adjacent continental shelf. Rubidium and strontium analyses were also made on the greater-than-20-micron and less-than-20-micron fractions of the samples to determine the effect of size frequency distribution on one of the parameters. Because the Rb to Sr ratio and the Sr-87 to Sr-86 ratio varies with grain size, some of the large variability in Sr-87 to Sr-86 in the Plata must be due to differential

sedimentation processes within the estuary. Consideration of the data on an isochron diagram reduces some of this ambiguity and is consistent with an interpretation of two major sources of sediment in the estuary. These sources are the rivers Parana and Uruguay at the head of the estuary and Argentine continental shelf sediment at the mouth. A third source, Uruguayan shield material, along the estuary's north shore, is not distinguishable. (See also W74-07225) (Knapp-USGS)
W74-07240

TECHNIQUES FOR USE OF ORGANIC AND AMORPHOUS MATERIALS IN SOURCE INVESTIGATIONS OF ESTUARY SEDIMENTS,
J. Neiheisel.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc, Memoir 133, p 359-381, 1972. 12 fig, 5 tab, 8 ref.

Descriptors: *Estuaries, *Bottom sediments, *Organic matter, *Analytical techniques, Electron microscopy, X-ray diffraction, Iron, Coak, Pyrite, Provenance, Differential thermal analysis, Water pollution sources, Gravimetric analysis, Mass spectrometry.

The organic materials in fine-grained Delaware estuary bottom sediment were determined by a combination of the electron microscope, mass spectrometer, chemical techniques, and thermal methods. Amorphous diatoms were identified by scanning electron micrographs, and were quantitatively determined by differential caustic leach methods. Amorphous hydrous iron compounds were determined by the sodium dithionite method. An especially effective combination of techniques to evaluate the pyrite, organic matter, and anthracite coal in the sediment was the use of differential thermal analysis, thermogravimetric analysis, and the mass spectrometer. The anthracite coal occurred in negligible amounts north of the confluence of the Schuylkill and Delaware Rivers and displayed progressive dispersal southward in the estuary. The coal had essentially a point source in the Schuykill River watershed that drains the anthracite coal fields of Pennsylvania. The greater amount of organic matter found in the vicinity of larger cities was attributed largely to sewage. Amorphous opaline diatoms were generally best represented in the more organic-rich sediment. Amorphous iron compounds appeared more abundant in the sediment in proximity to acid effluent discharge from industry. (See also W74-07225) (Knapp-USGS)
W74-07241

PROCESSES AFFECTING GAS DISTRIBUTIONS IN ESTUARINE SEDIMENTS,
Alaska Univ., College. Inst. of Marine Science.
W. S. Reeburgh.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 383-389, 1972. 6 fig, 6 ref. AEC contract AT(30-1)-3497.

Descriptors: *Water chemistry, *Chesapeake Bay, Carbon dioxide, Nitrogen, Bubbles, Methane, Argon, Hydrogen sulfide, Mixing.
Identifiers: *Dissolved gases.

Summer and winter depth distributions of Ar, N2, CH4, total CO2, and total H2S were obtained at two stations in Chesapeake Bay. The data indicate that CH4 escapes the sediments as bubbles, stripping Ar and N2 from the sediments. Total CO2 increases to concentrations greater than 1,000 milliliters per liter with depth, and pH remains constant at about 7. Low and uniform total H2S concentrations indicate removal of sulfur as iron sulfides. The absence of CH4 in the upper 25 centimeters of these sediments and the presence of Ar and N2 in concentrations similar to the overlying water indicate mixing to at least this depth. (See also W74-07225) (Knapp-USGS)
W74-07242

TEXTURE AND ORGANIC CARBON CONTENT OF BOTTOM SEDIMENTS IN SOME ESTUARIES OF THE UNITED STATES,
Middlebury Coll., Vt.
D. W. Folger.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 391-408, 1972. 13 fig, 48 ref. USGS contracts 14-08-0001-11498 and 14-08-0001-11987.

Descriptors: *Sedimentation, *Estuaries, Provenance, Distribution patterns, Clays, Silts, Sands, Mineralogy, Sediment transport, Facies(Sedimentary), *Bottom sediments, Sediment sorting, United States, Sediment distribution, *Organic matter.
Identifiers: *Organic carbon.

Most estuaries, lagoons, and bays of the United States can be divided into four groups based on the distribution of sediment texture at the bottom. Differences between groups reflect the geologic, hydrologic, and bathymetric conditions under which the sediments were deposited. Areas representative of each group include Penobscot Bay, Maine, where widespread clay near the head grades seaward into silt and sand near the mouth; San Francisco Bay, California, where sand accumulated mostly in channels and silt and clay are widespread on tidal flats and shallow areas around the bay margin; Mississippi Sound, Mississippi and Alabama, where silt and clay cover most of the bottom and sand is abundant around the margins; and Pamlico Sound, North Carolina, where sand covers most of the bottom and silt and clay are limited to the deepest areas and channel bottoms. Organic carbon concentrations in bottom sediments are most relatively unpolluted estuaries (Penobscot Bay, Maine; Apalachicola Bay, Florida) are less than 5%; only where vegetal matter is abundant (Whitewater Bay, Florida) or where bottom waters are anaerobic (Deep Inlet, Alaska) are values of natural organic carbon commonly higher. Abundant organic pollutants in estuarine waters (Boston Harbor, Massachusetts; Charleston Harbor, South Carolina) are often relected by organic carbon concentrations in bottom sediments of 10% to 20%. (See also W74-07225) (Knapp-USGS)
W74-07243

BIOGEOCHEMICAL VARIABLES IN BOTTOM SEDIMENTS OF THE RAPPHANNOCK RIVER ESTUARY,
South Carolina Univ., Columbia. Coll. of Arts and Sciences.
B. W. Nelson.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 417-451, 1972. 14 fig, 1 tab, 21 ref.

Descriptors: *Bottom sediments, *Estuaries, *Virginia, *Biochemistry, Stratigraphy, Biodegradation, Organic matter, Oxidation-reduction potential, Salinity.
Identifiers: Biogeochemistry, *Rappahannock estuary.

A transition from undifferentiated mud to estuarine sediment occurs in the bottom of the Rappahannock River estuary, Virginia, between the sediment-water interface and 100 centimeters in depth. The sediment profiles and their chemical properties respond to a dynamic equilbrium between sedimentation rate, depositional rate of organic detritus, and microbiological activity. The equilibrium is influenced by the general bathymetry and intensity of physical processes near the bottom, the salinity and ventilation of the bottom water, the composition of organic detritus, and sediment compaction processes such as dewatering and gas ebullition. Below 50 centimeters in depth, Eh typically becomes positive. In the lower estuary, less intense physical process in greater water depths and higher salinities cause higher rates of microbial activity. The chemical properties of estuarine sediment respond to the biological, chemical, and physical forces in their environment, and the particular expression of profile development at any location tends to reflect a dynamic equilibrium between these forces. (See also W74-07225) (Knapp-USGS)
W74-07244

RECENT ESTUARINE SEDIMENT HISTORY OF THE ROANOKE ISLAND AREA, NORTH CAROLINA,
East Carolina Univ., Greenville. Dept. of Geology.
M. P. O'Connor, S. R. Riggs, and D. Winston.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc, Memoir 133, p 453-463, 1972. 6 fig, 1 tab, 6 ref.

Descriptors: *Sedimentation, *Erosion, *Estuaries, *North Carolina, Water circulation, Barrier islands, Beaches, Sediment load, Streamflow, Atlantic Coastal Plain, Currents(Water), Sediment transport.
Identifiers: *Roanoke Island(NC).

Estuarine sediments from Croatan, Roanoke, and northernmost Pamlico Sounds in The Roanoke Island area of North Carolina demonstrate complex patterns of deposition and erosion. The sediments reflect the dynamic interplay between the freshwater and saltwater systems, as controlled by the shifting barrier island inlets from the Atlantic Ocean and the freshwater discharge from the mainland. During recorded history, and prior to 1817, inlets adjacent to or north of Roanoke Island were continuously open. During this time most of the Roanoke Island area was characterized predominantly by sediment deposition within a clear, saline, and productive estuarine system having a diverse benthic marine fauna. With the closing of the last of the northern inlets in 1817, the discharge from the Albemarle drainage system was diverted around Roanoke Island, widening and deepening Croatan Sound, and producing a highly variable, turbid, brackish water environment characterized by a restricted benthic fauna. Today, Croatan Sound is characterized in the central portions by active scour that exposes pre-Holocene peats and fossiliferous fine sands, erosion of the Recent salt marshes and peat beds along the shorelines, and slow deposition of very fine and fine-grained sediments over much of the rest of the area. Northermost Pamlico Sound is characterized by a shifting erosional-depositional regime to which fine-grained sand is supplied by the tidal currents of Oregon Inlet. Roanoke Sound is characterized primarily by a depositional regime in which fine sand, derived from the Atlantic system by wind action and storm washover, is actively filling the shallow sound. (See also W74-07225) (Knapp-USGS)
W74-07245

EROSIONAL AND DEPOSITIONAL ESTUARINE 'TERRACES,' SOUTHEASTERN UNITED STATES,
Georgia Univ., Sapelo Island. Marine Inst.
J. H. Hoyt.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America,

April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 465-473, 1972. 5 fig, 32 ref.

Descriptors: *Erosion, *Sedimentation, *Estuaries, *Terraces(Geologic), Sea level, Deposition(Sediments), Scour, Surf, Geomorphology, Surfaces, Water levels, *Southeast U.S.

After the formation of barrier islands, sediment accumulation in lagoons produces to major surfaces which form concurrently at the base and top of estuarine deposits. These surfaces range from less than one-half to more than 30 km wide, and are separated by as much as 30 m of estuarine sediment. The basal surface is erosional and is shaped by the shifting estuarine channels. Relief may be as much as several meters; the surface is undulatory and slopes gently seaward. Basal estuarine deposits are clayey sands and gravels. Gravels commonly are angular, and cut and fill structures and cross-stratification are abundant. The upper part of the estuarine deposits, the salt marsh sediments, are mainly clayey sands and silts, commonly cut by channels. The surface at the top of the estuarine sequence is depositional, the result of lagoonal filling which converts this area to a salt marsh. The upper limit of deposition is spring high tide. Relief may be several tens of meters as a result of channels. Only the depositional surrface could be considered a morphological terrace; however, during late stages of barrier island-estuarine development, when sediment supply may be insufficient to maintain the barriers, marine erosion may produce a wave cut and fill terrace. This type of terrace is rare in Quaternary deposits of southeastern United States because of modification and burial during the subsequent formation of the two major estuarine surfaces. (See also W74-07225) (Knapp-USGS)
W74-07246

SANTEE SUBMERGENCE, EXAMPLE OF CYCLIC SUBMERGED AND EMERGED SEQUENCES,
South Carolina Univ., Columbia. Dept. of Geology.
D. J. Colquhoun, T. A. Bond, and D. Chappel.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, SC: Geological Society of America, Inc, Memoir 133, p 475-496, 1972. 17 fig, 2 tab, 9 ref. NSF Grant GB-7375.

Descriptors: *Erosion, *Sedimentation, *Estuaries, *Terraces(Geologic), Sea level, Deposition(Sediments), Scour, Surf, Geomorphology, Surfaces, Water levels, *South Carolina.
Identifiers: *Santee River(So. Car.).

Subsurface geologic maps obtained through auger drilling investigation in east-central South Carolina illustrate cyclic development of terrace formations during continental submergence and emergence. Ancient estuarine deposits form part of these terrace formations. The history of filling of two valley systems, the Piedmont draining Santee River and the Coastal Plain draining Cooper River, are examined through three-dimensional stratigraphic sequences in the Illinoian-Sangamon and in the Holocene. Initial erosional disconformities are succeeded by alluvial aggraded bed load and overbank sediments, estuarine clay and marsh clay fills, shoestring channel fill sands, and deltaic sediments that prograde seaward. The Holocene estuaries are in a very early stage of the continental and marine submerged cycles, compared to the full cycle sediments of the ancient units. (See also W74-07225) (Knapp-USGS)
W74-07247

MARINE GEOLOGY AND ESTUARINE HISTORY OF MOBILE BAY, ALABAMA: PART 1. CONTEMPORARY SEDIMENTS,
Florida State Univ., Tallahassee. Dept. of Oceanography.
J. J. Ryan, and H. G. Goodell.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 517-554, 1972. 17 fig, 8 tab, 51 ref.

Descriptors: *Sedimentation, *Estuaries, *Alabama, Gulf coastal plain, Sedimentation rates, Sediment distribution, Bottom sediments, Water circulation, Suspended load, Sediment sorting, Mineralogy, Clays, Sands, Silts.
Identifiers: *Mobile Bay(Ala).

An annual average of 4.3 million metric tons of suspended sediment are being transported into the Mobile Bay estuary. The dominant terrigenous clastics are quartz, kaolinite, and montmorillonite. Circulation patterns within the estuary are controlled primarily by river discharge, tides, and geometry of the bay. Comparisons of the bathymetry of 1847 ti 1851 and 1960 to 1962 indicate an average shoaling of 56 cm per century. Aporoximately 1.3 million metric tons of suspended sediment is currently bypassing the estuary of being deposited to the south and west of the tidal inlet. Clean quartz sands occur around the periphery of the bay generally in water depths less than 2 m. Most of the bay bottom sediments consist of silty clays and clays. Grain size decreases and sorting increases downbay and to the southeast. Higher montmorillonite content near the bay-head delta and increasing kaolinite content toward the southeast in Bon Secour Bay are attributed to sediment dispersal patterns, differences in sedimentation rates, and to increase in kaolinite content in the suspended river sediments over the historic period, the result of the development of agriculture within the drainage basin. The distribution and ages of buried oyster reefs indicate a progressive downbay migration in response to progradation of the bay-head delta. (See also W74-07225) (Knapp-USGS)
W74-07248

EFFECTS OF MAN-MADE WORKS ON THE HYDRAULIC, SALINITY, AND SHOALING REGIMENS OF ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div.
For primary bibliographic entry see Field 5C.
W74-07249

EFFECT OF INCREASING DEPTH ON SALINITY IN THE JAMES RIVER ESTUARY,
Virginia Inst. of Marine Science, Gloucester Point.
M. M. Nichols.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 571-589, 1972. 11 fig, 2 tab, 15 ref.

Descriptors: *Estuaries, *Water circulation, *Sedimentation, *Water control, *Environmental effects, Dams, Dredging, River training, Flood control, Levees, Reservoir operation, *Salinity, Streamflow, Hydraulic models.
Identifiers: *James River Estuary(Va).

The effects of channel deepening on the salinity and density flow in the James River estuary, Virginia, were studied to predict changes that might affect oyster production. A hydraulic model with 1:1,000 horizontal and 1:100 vertical scales was employed to integrate three-dimensional changes in salinity and velocity through reaches of variable bottom geometry. After natural characteristics of the tide, current, and salinity were reproduced in the model, tests were run at three levels of steady river inflow, before and after a 3-meter channel deepening. Deepening produced the greatest salinity change in the middle estuary, where the major cut was performed. The lower water layer located mainly in the channel became saltier by about 0.5 part per thousand, whereas the upper layer over the oyster shoals became fresher by about 0.2 part per thousand. Changes in bottom water salinity were greatest at intermediate inflow and least at very low inflow. High freshwater inflow created the greatest change in vertical salinity gradient. With greater stratification, tidal velocities were less effective in promoting vertical mixing between lower and upper estuarine water layers, and the net volume transport in each layer was reduced. Since the changes in salinity and flow pattern due to channel deepening were small, no effects inimical to the oyster fishery were predicted. Similarly the prospective changes in sedimentary regime will not offset the beneficial effects of the proposed deepening project. (See also W74-07225) (Knapp-USGS)
W74-07250

HYDROLOGY OF THE DUNES AREA NORTH OF COOS BAY, OREGON,
Geological Survey, Portland, Oreg.
J. H. Robison.
Open-file report, 1973. 62 p, 30 fig, 2 plate, 15 tab, 23 ref, append.

Descriptors: *Hydrogeology, *Surface-groundwater relationships, *Oregon, Water levels, Anisotropy, *Dunes, Coasts, Analog models, Withdrawal, Water yield, Safe yield, Water resources development.
Identifiers: *Coos Bay(Oreg).

Hydrology of a 20-sq-mi area of dunes along the central Oregon coast was studied. The area is underlain by 80 to 150 feet of Quaternary dune and marine sand which overlies Tertiary marine clay and shale. Groundwater for industrial and municipal use is being withdrawn at a rate of 4 million gallons per day. Plans to withdraw as much as 30 million gallons per day are limited by the prospect of excessive lowering of levels in shallow lakes near the wells, and possibly seawater intrusion, if water-level gradients are reversed. At the present stage of development there are 18 production wells, each capable of producing 200-300 gallons per minute from the lower part of the sand deposits. Except for thin layers of silt, clay, and organic matter, the deposits of sand are clean and uniform; horizontal permeability is 100 times the vertical permeability. Because of the low vertical permeability, drawdown cones are not evident in the upper part of the aquifer adjacent to the wells. However, present pumping lowers general water levels in the lakes and the shallow groundwater zone by several feet. A two-layer electric analog model was built to analyze effects of present and projected development as well as any alternate plans. Model results were used to develop curves for short-term prediction of water levels. (Knapp-USGS)
W74-07325

SIZE AND SHAPE SORTING IN A DUTCH TIDAL INLET,
Groningen Rijksuniversiteit (Netherlands). Geological Inst.
A. M. Winkelmolen, and H. J. Veenstra.
Sedimentology, Vol 21, No 1, p 107-126, February 1974. 8 fig, 1 tab, 25 ref.

Descriptors: *Sediment sorting, *Particle size, *Particle shape, *Tidal waters, Deltas, Bottom sediments, Sediment transport, Littoral drift, Currents(Water).
Identifiers: Tidal flats, *Netherlands.

A tidal inlet system with an outer tidal delta, situated between two barrier islands along the north coast of Holland was studied for size and shape

sorting. Sand types can be distinguished using size data and distinct grain populations can be recognized. Graphs of shape values, plotted against the size intervals of samples also reveal the presence of different grain populations, together with their genetical significance. There is no sand transport directly from island to island. Sand of sizes up to 400 micrometers enters the tidal inlet, is sorted out in the tidal flat area and partly re-enters the sea via the outer tidal delta. On the delta, the sediment is split up again in different populations. A lag deposit is left behind on the frontal part of the delta. The rest of the sand either re-enters the tidal inlet cycle or contributes to the beach building of the next island. In the offshore environment, sand movement by wave-induced currents is restricted to the shallow zone. In deeper water, part of the sediment is relatively immobile and has preserved inherited characteristics from the early Holocene transgressive phase. In front of Ameland, fossil barrier-face deposits are present, off Schiermonnikoog the sea floor contains old tidal channel deposits. (Knapp-USGS)
W74-07329

FUNCTION OF MARSHES IN REDUCING EUTROPHICATION OF ESTUARIES OF THE MIDDLE ATLANTIC REGION,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W74-07336

SEASONAL ABUNDANCE AND DISTRIBUTION OF JUVENILE BLUE CRABS IN CORE SOUND, N.C. 1965-1966,
National Marine Fisheries Service, Beaufort, N. C. Atlantic Estuarine Fisheries Center.
H. Judy.
Chesapeake Sci. Vol 14, No 1, p 51-55, 1973. Illus.
Identifiers: Callinectes-Sapidus, *Commercial fishery, *Crabs(Blue), Distribution, Juvenile, Migration, *North Carolina(Cove Sound), *Seasonal.

Studies were made in Core Sound, North Carolina to determine the abundance and distribution of juvenile blue crabs, Callinectes sapidus, and their subsequent relation to the commercial fishery. Estimates of juvenile abundance were based on catches of small crabs in the marsh creeks bordering Core Sound. Young-of-the-year blue crabs (2.5-5.0 mm) begin to enter Core Sound estuary in early Oct. These small crabs move through the open waters of the sound and bays into the small marsh creeks and remain there until the following spring. At this time (April-May) the juvenile crabs move into the bays and sound proper where they remain to maturity. Catch and effort statistics from Core Sound commercial crab fishery were collected from Nov. 1964 through June 1968. Landings of approximately 680,000 kg annually constitue the fishery. --Copyright 1973, Biological Abstracts, Inc.
W74-07350

MARINE FUNGI ISOLATED FROM A KRAFT PULP MILL OUTFALL AREA,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W74-07396

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF NATURAL WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 2K.
W74-07419

SOME ASPECTS OF THE TEMPERATURE, OXYGEN AND NUTRIENT DISTRIBUTIONS IN MONTEREY BAY, CALIFORNIA. ANNUAL REPORT, PART 1, 1973,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W74-07469

FIELD AND EXPERIMENTAL STUDIES ON THE SYSTEMATICS AND ECOLOGY OF ULVA CURVATA AND ULVA ROTUNDATA,
North Carolina Univ., Chapel Hill. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-07473

BIOLOGICAL INVESTIGATIONS OF NOXIOUS COELENTERATES AND CTENOPHORES IN COASTAL NORTH CAROLINA,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
R. J. Schwartz, and A. F. Chestnut.
Available from the National Technical Information Service as COM73-11128, $7.00 in paper copy, $1.45 in microfiche. National Marine Fisheries Service, Washington, D.C., Report NOAA-73052109, April 1973. 96 p, 32 fig, 28 tab, 65 ref, append. JF-2-9. PL 88-309.

Descriptors: *Jelly fish, *Distribution, *North Carolina, *Coasts, Water temperature, Salinity, Systematics, Fish, Economic impact, Bibliographies.
Identifiers: *Coelenterates, *Ctenophores, Albermarle Sound(N.C.), Pamlico Sound(N.C.).

Preliminary to attempting to control or eliminate jellyfish and other such pests, in late 1971 a project was devised to determine what species of jelly-fishes and ctenophores inhabit North Carolinian waters, at what seasons, at what depths, and in what abundance. The study encompassed their life histories and needs, what associations of species and environment triggered or permitted their presence, and the effect upon man and his utilization of the area. The coastal estuarine and marine waters of North Carolina were divided into five sampling areas where the past geologic history, the physical and chemical features, temperature and salinity profiles, circulation and current patterns, and invertebrate fauna were studied. Extensive graphs, maps, and tabulations of their occurrences are included. Seven species of jellyfishes and two ctenophores were encountered, each with a seasonal preference as to occurrence, water temperature, salinity, and depth distribution. A bibliography of coelenterates that occur in North Carolina and adjacent waters containing 94 references is appended. (Jones-Wisconsin)
W74-07479

INVESTIGATION OF THE BIOLOGY AND CONTROL OF NOXIOUS COELENTERATES OCCURRING IN THE COASTAL WATERS OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.
C. E. Cutress.
Available from the National Technical Information Service as COM73-11095, $4.25 in paper copy, $1.45 in microfiche. National Marine Fisheries Service, Washington, D.C. Report No. NOAA 73052118, July 1972. 40 p, 6 fig, 8 tab, 4 plates, 2 ref. JF-2-6. PL 88-309.

Descriptors: *Jelly fish, *Coasts, *Puerto Rico, Safety, Life history studies, Distribution, Beaches, Public health, Systematics, Mangrove swamps.
Identifiers: *Coelenterata, Cubomedusae.

Coelenterates long have been troublesome to fishermen and swimmers off the Puerto Rican coasts. Stingings occur regularly but seasonally, and occasionally in epidemic proportions at swimming beaches. Eight jellyfish species are at one time or another responsible for injuries to swimmers but three species are the major offenders. Extensive barrier coral reefs and mangrove lagoons off coastal Puerto Rico are the habitats of sessile stages of nearshore jellyfish species, some of which are bothersome to bathers. The pattern of occurrence and distribution of the principal stinging species seems to be correlated with nearshore hydrographic conditions and proximity of the beaches to mangrove lagoons suggesting that the problem in such instances might be alleviated by slight alterations of a physical feature of the shore. Investigation was begun with preliminary surveys of swimming beaches, marinas, and fishing ports allowing an insight into the nature and extent of the problem. Jellyfish collected during 1969 to 1971 are listed and some illustrated. Life histories of several are described. Of the 32 known jellyfish fauna off Puerto Rico, some are weak stingers while others, while rare, are capable of causing injury. (Jones-Wisconsin)
W74-07480

A STUDY OF THE MOVEMENT OF PHOSPHOROUS IN THE LITTLE RIVER ESTUARY, N.S.W.,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 5B.
W74-07483

AN INVESTIGATION OF PROPAGATION AND THE MINERAL NUTRITION OF SPARTINA ALTERNIFLORA,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5C.
W74-07486

KELP HABITAT IMPROVEMENT PROJECT, ANNUAL REPORT JULY 1, 1970 - JUNE 30, 1971.
California Institute of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
For primary bibliographic entry see Field 5C.
W74-07489

KELP HABITAT IMPROVEMENT PROJECT, ANNUAL REPORT JULY 1, 1971 - JUNE 30, 1972.
California Institute of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
For primary bibliographic entry see Field 5C.
W74-07490

PROCEEDINGS 2ND ANNUAL TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.
Available from the National Technical Information Service as COM-73-11310; $4.25 in paper copy, $1.45 in microfiche. March 16-17, 1972. Oregon State Univ., Corvallis. Engineering Experiment Station Circular No 44, (1972). 111 p, 45 fig, 12 tab, 71 ref.

Descriptors: *Estuaries, *Conferences, *Pacific Northwest U.S., Migration, Oregon, Anadromous fish, Mathematical models, Primary productivity, Fjords, Ecosystems, Alaska, Tidal waters, Flow, Retention, Winds, Shore protection, Breakwaters, Economics, Water pollution control, Navigation, Protection, Zoning, Management.

Sensitivity of estuaries signals need for better understanding of estuarine processes but their complexity makes simplistic solutions unrealistic and detailed solutions difficult. Papers presented at this conference enhance the knowledge of estuarine ecosystems and of their physical properties--a prerequisite to intelligent management of estuarine and coastal areas. The following subjects are covered by contributors: Some estuarine factors influencing ascent of anadromous cutthroat trout in Oregon, A strategy for modeling primary production in stratified fjords, An ecosystem study in the inside passage of southeastern Alaska, Difficulties ahead for Oregon regarding estuary

regulations, control and protection, The National Shoreline Study, Physical modeling of residence times in tidal basins, The influence of wind on the surface waters of Alberni Inlet, State of the art of floating breakwaters, Laws and regulations of pollution and navigation in Pacific Northwest estuaries, Technical and economic issues in water quality management in Yaquina Bay, and Pacific Northwest coastal zone management as it relates to estuary protection. The development of policies and standards based on the carrying capacities of the natural resources should insure their protection. (See W74-07492 thru W74-07500) (Jones-Wisconsin)
W74-07491

NEW CONCEPTS IN ENVIRONMENTAL PLANNING,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W74-07492

SOME ESTUARINE FACTORS INFLUENCING ASCENT OF ANADROMOUS CUTTHROAT TROUT IN OREGON,
Oregon State Game Commission, Corvallis.
R. D. Giger.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 18-29 (1972). 9 fig, 13 ref.

Descriptors: *Estuaries, *Migration, *Anadromous fish, *Oregon, Geomorphology, Salinity, Water temperature, Distribution, Salmonids, Sport fishing, Dredging, Salmon, Depth, Cutthroat trout.
Identifiers: Alsea River(Ore), Siuslaw River(Ore), Nestucca River(Ore).

Study of coastal cutthroat trout, Salmo clarki clarki, on the north-central Oregon coast was directed primarily toward improvement of angler catches of hatchery-reared cutthroat through the manipulation of liberation times. To determine the timing and location of the estuary catch, information on fish distribution and movement was gathered and related to gross measurements of estuary geometry, salinity, and temperature. Results of estuary studies centering on the Alsea River are reported. Approximately 2000 sea-run cutthroat were captured and marked. More than 300 tags from these fish were subsequently returned providing information on timing of migration, estuary movements, length of estuary residence, and distribution and intensity of sport catch. Angler catch sampling gave additional information on food habits and fish movements. High temperatures in upper estuary areas of some coastal rivers prevent passage of fish that might otherwise migrate further upstream; as a result, ascending fish congregate in estuary areas of suitable temperature and depth immediately downstream until water temperatures moderate in the fall, thus the extended period of summer residence is advantageous to the estuary sport fisheries. Alteration of temperature regimes, depths, or perhaps other features could change fish distributional patterns and ultimately affect the success of fisheries. (See also W74-07491) (Jones-Wisconsin)
W74-07493

A STRATEGY FOR MODELING PRIMARY PRODUCTION IN STRATIFIED FJORDS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-07494

AN ECOSYSTEM STUDY IN THE INSIDE PASSAGE OF SOUTHEASTERN ALASKA,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-07495

PHYSICAL MODELING OF RESIDENCE TIMES IN TIDAL BASINS,
Alaska Univ., College. Dept. of Ocean Engineering.
T. Carstens.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 59-65 (1972).

Descriptors: *Model studies, *Tidal effects, *Basins, *Retention, Fjords, Bathymetry, Prototypes, Stratification, Diffusion, Circulation, Estuaries.
Identifiers: *Residence time.

The memory of a water body depends on its topography and on the energy input. The memory is most conveniently described by a single parameter--residence time. The average residence time, defined as the ratio of total basin volume to the average throughflow, has only a limited value if the actual flux of renewal water does not flush the entire basin. Examples are given to demonstrate the need for a more detailed answer to the question of residence time than its gross average. It appears useful and necessary to break down the basin in sub-basins according to realistic estimates of the local residence time. Of particular interest in the feasibility of small-scale physical models are the possibilities of obtaining residual tidal currents quickly and inexpensively, compared with in situ observations, and simulating residence times in stratified basins. Restrictions on the method are that the tidal range should be appreciable and that some information is available on the vertical eddy diffusion coefficient from in situ tracer experiments. The small-scale physical model is not a high-precision tool, however its chief advantage is that it displays local closed circulations, which are ignored in the present generation of mathematical models. (See also W74-07491) (Jones-Wisconsin)
W74-07496

THE INFLUENCE OF WIND ON THE SURFACE WATERS OF ALBERNI INLET,
British Columbia Univ., Vancouver. Dept. of Physics.
D. M. Farmer.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 66-73 (1972). 9 fig, 5 ref.

Descriptors: *Winds, *Surface waters, *Inlets(Waterways), *Stratification, Model studies, Bays, Fjords, Currents(Water), Estuaries, Energy, Conductivity, *Canada.
Identifiers: *Alberni Inlet(Vancouver Island).

Strong winds occur along the steep-sided inlets of the Pacific Northwest with a profound effect on the density structure of their highly stratified surface waters. Alberni Inlet, Vancouver Island was chosen for the experiment, timed to coincide with a Canadian Hydrographic Service current and tide survey during the late winter and spring of 1971. Special instruments were built to measure conductivity. Wind was measured using four recording anemometers mounted 2 meters above the ground on exposed points. Observations of wind, current, and surface water layer thickness in Alberni Inlet have helped elucidate some of the ways in which the system responds to a surface stress. Much of the wind energy is diurnal and a close coupling exists at this frequency between wind and current at a depth of 2 meters. On the other hand, most of the energy associated with changes in the surface water layer thickness is of significantly lower frequency. A simple two-layer frictional model is able to explain much of what is observed and can be used to predict the surface layer thickness on the basis of measured wind speeds. (See also W74-07491) (Jones-Wisconsin)
W74-07497

STATE OF THE ART OF FLOATING BREAKWATERS,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8A.
W74-07498

LAWS AND REGULATIONS OF POLLUTION AND NAVIGATION IN PACIFIC NORTHWEST ESTUARIES,
Coast Guard, Portland, Oreg.
For primary bibliographic entry see Field 5G.
W74-07499

ENVIRONMENTAL PLANNING: AN ECONOMIC ANALYSIS. APPLICATIONS FOR THE COASTAL ZONE,
Clemson Univ., South Carolina. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 6B.
W74-07534

TAXONOMIC POSITION OF TWO LUMBRINERIS SPP.,
Canterbury Univ., Christchurch (New Zealand). Dept. of Zoology.
G. A. Knox, and K. M. Green.
New Zealand Journal of Marine and Freshwater Research, Vol 7, No 3, p 247-252, September 1973. 2 fig, 8 ref.

Descriptors: *Worms, *Systematics, *Annelids, Speciation, *Australia.
Identifiers: *Lumbrineris, Polychaetes, Animal morphology, *New Zealand.

Two species with unusual features not typically seen in the Lumbrineridae have recently been found: one, identified as Lumbrineris mucronata, is from the north-east coast of Australia, and the other, identified as L. sulcaticeps, is from the south-east coast of New Zealand. Both species are unusual in that maxilla IV is multidentate. In addition, the entire surface of the plate is covered by small, hard projections, thus forming what appears to be a rasping plate; these projections give the pale-colored plate a speckled appearance. The posterior hooks of both species are simple, and basically bidentate. The hoods of these hooks are almost circular. (Mortland-Battelle)
W74-07568

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

SELF CLEANING, TUBULAR SOLAR STILL,
ESB, Inc., Philadelphia, Pa. (assignee).
J. P. Coffey, and J. C. Duddy.
U.S. Patent No 3,785,931, 3 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1163, January 15, 1974.

Descriptors: *Patents, *Distillation, *Desalination, *Solar stills, Water treatment, Solar radiation, *Evaporation, *Condensation, Separation techniques, Water quality control.

A microporous evaporator having a dark exterior surface is located within but not touching a concentric tube of clear material serving as a condensing surface. Raw water is fed to the top of the porous evaporator and slowly percolates down to the bottom of the member to a waste water drain.

Sunlight hitting the dark evaporator surface causes water to evaporate giving off pure water vapor. The water vapor is condensed on the inside of the clear tube. As condensed water collects on the clear tube, it runs down to be collected as purified water. The evaporator and condenser tube are normally located in a vertical or near vertical position. For tropic installation, simple reflectors direct the sun's rays on one or more tubes. For operation at higher latitudes, the tubes can be positioned so as to be more or less perpendicular to an average sun ray taking account of latitude declination and times of sunlight, or reflectors can be so directed. (Sinha - OEIS)
W74-07207

PLANNING AND OPERATIONAL STUDIES IN THE INTEGRATED USE OF DESALINATION. CASE STUDIES FOR CYPRUS AND JERSEY,
Water Research Association, Marlow (England).
P. A. Mawer, and T. Wyatt.
Desalination, Vol 13, No 3, p 333-342, December 1973. 7 fig, 1 tab, 2 ref.

Descriptors: *Water supply development, *Desalination, Desalination plants, *Long-term planning, Operation and maintenance, *Simulation analysis, Water quality control, Evaluation, Reliability, Optimization, Irrigation, Water demand, Surface waters, Systems analysis, Mathematical models.
Identifiers: *Cyprus, *Great Britain(Jersey-Channel Islands), Least cost, Control rules.

Two case studies are described relating to the integrated use of desalination with conventional water resources. The studies contrast the different requirements of a long-term planning study with those of an assessment of existing system operation. The first study is concerned with an examination of the potential role of desalination in the long-range development of Cyprus' water resources. Special features of this research are the strong influence of irrigation demands and the need to derive plans which are flexible against an only partially-defined future. The importance of extended periods of planning and preparatory plant operation is emphasized. The second study deals with the 1.5 mgd MSF plant operated by the Jersey New Water Works Company (Jersey, Channel Islands), where the objective is to maintain overall supply reliability at minimum cost. Greater attention is given to recognition of the detailed system constraints. The plant is operated in conjunction with an unusually complex system of surface water resources which present special difficulties in the optimization of control rules for the desalination plant. Discussed is a detailed model for simulating the system. Results, provided in the form of control rules, are also discussed. In both study cases, the most important need is to recognize the desalination plant as a component of the total water supply system. (Bell-Cornell)
W74-07308

3B. Water Yield Improvement

EFFECT OF CONTOUR FURROWS AND CONTOUR BUNDS ON WATER CONSERVATION IN GRASSLANDS OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07090

THE SAGUARO GIANT CACTUS, A BIBLIOGRAPHY,
National Park Service, San Francisco, Calif.
For primary bibliographic entry see Field 2I.
W74-07098

MODEL TESTS WITH THIN SHEETS TO REDUCE EVAPORATION,
Research Inst. for Water Resources Development, Budapest (Hungary).
A. F. Thoma.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 99, No IR2, Proc. Paper 9779, p 117-131, June 1973. 8 fig, 7 tab, 9 ref, 2 append.

Descriptors: *Evaporation control, *Monomolecular films, *Water conservation, *Air temperature, Lakes, Reservoirs, Irrigation, Evaporation, Evaporation pans, Evaporimeters, On-site investigations, Plastics, Surface waters.

The efficiency of a thin suspended sheet in reducing evaporation was tested to determine the relationship between evaporation reduction and the height of the sheet above the water. Sheet (S1) consisted of a 0.3 mm thick plastic sheet, while sheet (S2) was prepared from one 2 mm thick plywood covered on both sides with oil. All tests were carried out under controlled laboratory conditions. Results showed that evaporation reduction may be achieved by using a thin sheet placed above the water surface, but not necessarily in contact with it; and the higher the air temperature, the greater the amount of evaporation reduction. The evaporation reduction effect was 37.3 percent in the open air model test. Future tests should include a greater number of independent variables to more closely approximate naturally occurring processes. (Mastic-Arizona)
W74-07103

STUDY ON THE PASTURE ESTABLISHMENT TECHNIQUE VI. EFFECT OF DIFFERENT SPACINGS AND WEEDINGS ON ESTABLISHMENT AND FORAGE PRODUCTION OF CENCHRUS CILIARIS LINN., LASIURUS SINDICUS HENR. AND PANICUM ANTIDOTALE RETZ UNDER ARID CONDITIONS,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07107

PRODUCTIVITY AND WATER STRESS IN CACTI,
Arizona State Univ., Tempe.
For primary bibliographic entry see Field 2I.
W74-07109

DISTILLATION-CONDENSATION OF WATER AND NUTRIENT MOVEMENT IN A DESERT ECOSYSTEM,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 2I.
W74-07110

3C. Use Of Water Of Impaired Quality

EFFECT OF GYPSUM IN REDUCING BORON HAZARD OF SALINE WATERS AND SOILS,
Central Soil Salinity Research Inst., Karnal (India).
I. C. Gupta, and H. Chandra.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 228-230, Sept. and Dec. 1972. 2 tab, 1 ref.

Descriptors: *Gypsum, *Boron, *Soil treatment, *Saline soils, *Saline water, Sodium, Soil water, Arid lands, Soil amendments, Land management.

Saline water, a common problem in arid zones, is unsatisfactory for agriculture because of high osmotic pressure, high sodium hazard, or high boron hazard. While gypsum has been known as a treatment for sodium hazard, this study has found it also reduces the boron hazard of saline water and saline sodic soil. Eighty percent dose of gypsum reduced the toxicity of sodic soil while one percent was sufficient to have the same effect on water. The gypsum used must be boron-free. (Muller-Arizona)
W74-07095

AN ECONOMIC ANALYSIS OF SELECTED AGRICULTURAL USES OF WARM WATER IN THE PACIFIC NORTHWEST RESULTING FROM ELECTRIC POWER GENERATION,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
R. W. Johns, R. J. Folwell, R. T. Dailey, and M. E. Wirth.
Journal of Environmental Quality, Vol 2, No 2, p 224-228, 1973. 1 fig, 4 tab, 16 ref.

Descriptors: *Water reuse, *Economic feasibility, *Heated water, Pacific Northwest U.S., Cooling water, Agriculture, Aquiculture, Greenhouses, Thermal pollution.

Between 1970-1990 85% of all electricity generated will require cooling water. Three uses of this cooling water are examined for the Pacific Northwest to determine whether the warm water could be used to aid fish growth, under the limits established by the reduced water quality caused by the heating, and the economics of raising carp and catfish. It is estimated that carp, used in various animal meals, would require a price of $59.52 metric ton compared to the existing price of $55-60 to encourage investment. The 1970-71 price of catfish--26 cents lb--exceeds the required investment price of 20 cents lb to raise catfish in a 1500 acre cooling pond. The market price for catfish, however, has declined over the past five years and declines are expected to continue. The second use, heating greenhouses was also found to be a marginal investment. Use of the cooling water for soil warming systems is limited by high initial investment cost, yield responses, and prices. A soil warming technique found to be profitable for 20 of 29 crops examined at installation costs of $2000/acre was found profitable only for 1 out of 29 vegetable crops when installation costs increased to $5000/acre. (Schroeder-Wisconsin)
W74-07125

INTERDISCIPLINARY MODELING IN THE ANALYSIS OF THE SALINITY PROBLEMS OF THE SAFFORD VALLEY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-07297

EFFECT OF IRRIGATION WITH THERMAL WATER ON TRACE-ELEMENT CONTENT IN SOME SOILS OF GEORGIA (VLIYANIYE OROSHENIYA TERMAL'NYMI VODAMI NA SODERZHANIYE MIKROELEMENTOV V NEKOTORYKH POCHVAKH GRUZII),
For primary bibliographic entry see Field 3F.
W74-07508

3D. Conservation In Domestic and Municipal Use

TECHNOLOGY TRANSFER IN THE MARINE ENVIRONMENT OF LONG ISLAND,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 6B.
W74-07059

SANITARY SERVICES IN TENNESSEE, 1972.
Tennessee State Planning Office, Nashville.
For primary bibliographic entry see Field 5D.
W74-07060

PRELIMINARY WATER AND SEWER PLAN FOR ALCORN, BENTON, MARSHALL, PRENTISS, TIPPAH, TISHOMINGO COUNTIES.
Northeast Mississippi Planning and Development District, Booneville.
For primary bibliographic entry see Field 5D.
W74-07062

WATER AND WASTEWATER SYSTEMS INVENTORY - REGION H, NORTH CAROLINA,
Pee Dee Council of Governments, Troy, N.C.
For primary bibliographic entry see Field 5D.
W74-07063

BACKGROUND SURVEY. SURFACE DRAINAGE PROGRAM, MADISON, SAINT CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 4A.
W74-07066

THE RELATIONSHIP OF LAND USE TO WATER USE IN SAN ANTONIO, TEXAS,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-07067

URBAN IMPACTS OF RURAL RESOURCE DEVELOPMENT EXPENDITURES IN THE INTERLAKE AREA OF MANITOBA,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 6B.
W74-07068

UTILITIES AND FACILITIES FOR NEW RESIDENTIAL DEVELOPMENT: A SURVEY OF MUNICIPAL POLICY,
Urban Land Inst., Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-07071

PLANNING AND DEVELOPING WATERFRONT PROPERTY,
Rick Engineering Co., San Diego, Calif.
For primary bibliographic entry see Field 6B.
W74-07072

WATER QUALITY MANAGEMENT ELEMENT FOR THE KENTUCKY RIVER AREA DEVELOPMENT DISTRICT COMPREHENSIVE WATER AND SEWER PROGRAM.
Mayes, Sudderth and Etheredge, Inc., Lexington, Ky.
For primary bibliographic entry see Field 5D.
W74-07077

MEASURES TO REDUCE WATER CONSUMPTION IN SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 6D.
W74-07079

PROPOSED WATER SUPPLY PROJECTS FOR SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 6D.
W74-07080

INTERIM STORM DRAINAGE PLAN REPORT-LITTLE ROCK-NORTH LITTLE ROCK METROPOLITAN AREA.
Metroplan, Little Rock, Ark.
For primary bibliographic entry see Field 5D.
W74-07082

STUDY DESIGN. SURFACE DRAINAGE PROGRAM, MADISON, ST. CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 4A.
W74-07083

PUBLIC GROUNDWATER SUPPLIES IN ADAMS COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 4B.
W74-07172

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-07334

USER CHARGES AND INDUSTRIAL COST RECOVERY, DENVER SMSA,
Wilbur Smith and Associates, Denver, Colo.
For primary bibliographic entry see Field 5D.
W74-07370

THE GEOLOGY OF WATER: THE LIMITING FACTOR IN URBAN DEVELOPMENT,
Indiana Purdue Univ., Indianapolis. Dept. of Geology.
A. Mirsky.
Proceedings of the Indiana Academy of Science, Vol 82, p 310-317, 1972. 3 fig, 1 tab, 5 ref.

Descriptors: *Water resources, *Water requirements, *Urban hydrology, *Human population, Surface waters, Subsurface waters, Aquifer characteristics, Water quality control, Geomorphology, Hydrogeology, Urbanization.

Of the several factors which bear on the initial establishment and later development of an urban center, the availability of adequate local water supplies is most important. The amount of available water includes that which is already obtained from surface sources plus underground aquifers, as well as local water reserves which can readily be estimated from the geological setting. If any expanding urban area, such as Indianapolis, is to avoid major water crises and the attendant deterioration in the quality of metropolitan life, consideration must be given to setting a population limit within the capacity of the local water resource, and directing excess population elsewhere. (Brown-IPC)
W74-07402

3E. Conservation In Industry

ECONOMIC STUDY OF THE EFFECT OF MUNICIPAL SEWER SURCHARGES ON INDUSTRIAL WASTES AND WATER USAGE,
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W74-07057

POLLUTION, PRODUCTION, AND COMPENSATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5G.
W74-07064

REGENERATION OF CHROMATED ALUMINUM DEOXIDIZERS, PHASE I REPORT,
Boeing Commercial Airplane Co., Seattle, Wash.
For primary bibliographic entry see Field 5D.
W74-07254

MODULAR WASTEWATER TREATMENT SYSTEM DEMONSTRATION FOR THE TEXTILE MAINTENANCE INDUSTRY,
Linen Supply Association of America. Miami Beach, Fl. and Institute of Industrial Launderers Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-07343

IN-PLANT, CONTINUOUS HOT-GAS BLANCHING OF SPINACH,
National Canners Association, Berkeley, Calif. Western Research Lab.
J. W. Ralls, H. J. Maagdenberg, N. L. Yacoub, M. Zinnecker, and D. Homnick.
J Food Sci. Vol 38, No 2, p 192-194. 1973.
Identifiers: Ascorbic acid, *Blanching(Hot-gas), Chemical oxygen demand, Continuous, Reduction, *Spinach, Vegetables, Waste water, *Food canneries, Pilot plants.

A new blanching system for vegetables (hot-gas blanching) which showed promise in pilot plant studies was tested in a commercial spinach cannery. The hot-gas blancher was operated at 93-121 degrees C with a spinach residence time of 108 sec. Four tons of washed spinach was hot-gas blanched and returned to the commercial filling line; the volume of wastewater produced was 1% of that from the commercial blancher (per ton blanched). A reduction of 96% in COD (chemical oxygen demand) was achieved by substituting hot-gas blanching for hot-water blanching. Differences were found in the flavor, head-space gas composition and ascorbic acid content of hot-gas blanched spinach compared to commercial canned samples.--Copyright 1973, Biological Abstracts, Inc.
W74-07368

WATER REUSE AND RECYCLE IN THE D(C)EDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
For primary bibliographic entry see Field 5D.
W74-07377

REDUCTION OF THE VOLUME OF POLLUTANTS DISCHARGED AND OF FRESH WATER CONSUMPTION (SOKRASHCHENIE SBROSA ZAGRYAZNENII I UMEN'SHENIE RASKHODA SVEZHEI VODY),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost (USSR).
For primary bibliographic entry see Field 5D.
W74-07384

WATER REUSE AND RECYCLE IN KRAFT BLEACHERIES,
CIP Research Ltd., Hawkesbury (Ontario).
For primary bibliographic entry see Field 5D.
W74-07394

A REVIEW OF COLOUR REDUCTION TECHNOLOGY IN PULP AND PAPER MILL EFFLUENTS,
Beak (T. W.) Consultants Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5D.
W74-07406

POLLUTION CONTROL BY RECYCLING EFFLUENT,
Kimberly-Clark of Canada Ltd., Huntsville (Ontario).
For primary bibliographic entry see Field 5D.
W74-07407

WATER REUSE IN PROTEIN FEED PROCESS UTILIZING LUMBER MILL WASTES,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 5D.
W74-07409

AN OVERVIEW OF WATER REUSE POTENTIAL IN PULP AND PAPER MANUFACTURING,
Wapora, Inc., Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-07410

THE PULP AND PAPER INDUSTRY AND THE ENVIRONMENT,
British Paper and Board Makers' Association, London (England).
For primary bibliographic entry see Field 5D.
W74-07411

3F. Conservation In Agriculture

SUBSURFACE HEATING AND IRRIGATION OF SOILS: ITS EFFECT ON TEMPERATURE AND WATER CONTENT AND ON PLANT GROWTH,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-07054

PUBLIC INVESTMENT CRITERIA: APPLICATION TO A PROJECT IN THE SOURIS RIVER BASIN,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 6B.
W74-07070

EVAPOTRANSPIRATION ON A PALOUSE WATERSHED,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W74-07087

EFFECT OF CONTOUR FURROWS AND CONTOUR BUNDS ON WATER CONSERVATION IN GRASSLANDS OF WESTERN RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
W. Ullah, A. K. Chakravarty, C. P. Mathur, and N. S. Vangani.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 169-182, Sept and Dec 1972. 1 fig, 5 tab, 17 ref.

Descriptors: *Contour furrows, *Soil treatments, *Grasslands, *Soil moisture, Soil management, Percolation, Infiltration, Moisture availability, Precipitation(Atmospheric), Induced infiltration, Retention, Soil water, Storage capacity, Water storage, Cultivation, Range grasses, Range management, Forage grasses, Soil-water-plant relationships.
Identifiers: *India(Rajasthan).

Four study areas were established in Rajasthan, India, to examine the effect of contour furrows and contour bunds on soil moisture conservation and forage yield from rangelands. These treatments increased forage production from 14 to 180 percent in 1966 and from 4 to 37 percent in 1967. The treatment indicated comparatively higher moisture percentages in different areas. Key forages and perenial grasses are identified and the effects of the treatment on their yield are discussed. The contour furrowing essentially retards the drainage from precipitation until it has a chance to infiltrate into the soil horizon. In this way water which would otherwise be lost in runoff will be stored in the soil for the use of the forage grasses. The treatment is recommended for yield augmentation in dry rangeland regions such as the study areas. (Muller-Arizona)
W74-07090

EFFECT OF SEEDING RATES AND ROW SPACINGS ON FODDER PRODUCTION OF MOTH BEAN (PHASEOLUS ACONITIFOLIUS),
Central Sheep and Wool Research Inst., Jaipur (India).
A. S. Faroda.
Annals of Arid Zone, Vol 11, Nos 3 and 4, p 183-186, Sept. and Dec. 1972. 1 tab, 2 ref.

Descriptors: *Forage legumes, *Planting management, *Soil-water-plant relationships, *Rates of application, Forages, Cultivation, Seeds, Plant growth, Application methods, Competition, Moisture availability, Soil water.
Identifiers: *Row spacing, *India(Rajasthan).

The seeding rates of 20 and 25 kg seed per hectare produced more green and dry vegetative material in moth beans than 15 kg seed per hectare, although the difference between the first two rates is negligible. Line sowing at a row spacing of 25 cm was better than broadcasting and line sowing at 50 cm row spacing. Since plant-to-plant distances were maintained uniformly, the yield in the wide row spacing case was probably lower because the distance between the plants in a row was less than the distance between rows and the competition of the plants within the row was intensified. The seeding and planting methods discussed above are believed to reduce excessive plant competition for water. (Muller-Arizona)
W74-07091

EVAPORATION FROM AN IRRIGATED RICE CROP IN A SEMI-ARID REGION,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 2D.
W74-07096

AGROCLIMATIC REGIONS OF RAJASTHAN,
Central Arid Zone Research Inst., Jodhpur (India).
A. K. Sen.
Annals of Arid Zone, Vol 11, Nos 1 and 2, p 31-40, March and June 1972. 2 maps, 1 tab, 14 ref.

Descriptors: *Climatic zones, *Regional analysis, *Agroclimatology, *Arid climates, Geographical regions, Semiarid climates, Meteorological data, Microclimatology, Agriculture, Micrometeorology, Weather, Crops, Available water.
Identifiers: *India(Rajasthan).

Various climatic elements, water availability factors and agricultural variables were employed in the classification and mapping of agroclimatic conditions in the Rajasthan dryland region of India. The six climatic variables were average and variational temperature, peak rainfall, rainfall to temperature relationship, climatic homogeneity and humidity. The indices used in defining the agricultural or crop component of the classification were geographic crop distribution, land use, crop yield and intensity, and the location and area of a specific crop. The availability of irrigation water and rainfall were also considerations. The region was found to be suitably divided into 5 larger macroclimatic zones and 10 smaller micro agro-climates. A table is presented in which each of the areas is described in detail with respect to climatic, irrigation, and land use conditions. This classification appears to be a useful tool in the regional agricultural planning for Rajasthan. (Muller-Arizona)
W74-07102

POPULATION, LAND USE AND LIVESTOCK COMPOSITION IN INDIA AND ITS ARID ZONE,
Central Arid Zone Research Inst., Jodhpur (India).
S. P. Malhotra, J. S. Rao, D. Goyal, and F. C. Patwa.
Annals of Arid Zone, Vol 11, Nos 1 and 2, p 116-127, March and June 1972. 4 tab, 5 ref.

Descriptors: *Regional analysis, *Water resources, *Land use, *Livestock, Arid lands, Regional development, Regional economics, Arid climates, Water resources development, Population, Human populations, Economics, Rural area, Land development, Land resources, Agriculture, Cereal crops, Cotton.
Identifiers: *India(Rajasthan).

Ten percent of the land surface of India is classified as arid. Most of this is in the Rajasthan region which has a population of approximately 19 million. Mean annual rainfall is inversely correlated with population growth in the area but positively correlated to total population. Twenty-five percent or more of the arable wastelands of India are in the region. The crops are principally rainfed, but the incidence of irrigation is increasing. Wheat, barley, maize and cotton are the principal crops cultivated, with the region producing only a minor portion of the cereals crop of India but a significant part of the cotton. Approximately seven percent of the total livestock in India is raised in Rajasthan. Permanent pastures and grazing lands are available in the area. The development of available water resources and the identification of new ones is the key to the further development of the region. (Muller-Arizona)
W74-07105

QUALITY OF WELL WATERS OF JAIPUR DISTRICT,
Udaipur Univ. (India).
For primary bibliographic entry see Field 4B.
W74-07106

STUDY ON THE PASTURE ESTABLISHMENT TECHNIQUE VI. EFFECT OF DIFFERENT SPACINGS AND WEEDINGS ON ESTABLISHMENT AND FORAGE PRODUCTION OF CENCHRUS CILIARIS LINN., LASIURUS SINDICUS HENR. AND PANICUM ANTIDOTALE RETZ UNDER ARID CONDITIONS,
Central Arid Zone Research Inst., Jodhpur (India).
A. K. Chakravarty, and C. M. Verma.
Annals of Arid Zone, Vol 11, Nos 1 and 2, p 60-66, March and June 1972. 2 fig, 1 tab, 5 ref.

Descriptors: *Water yield improvement, *Pasture management, *Plant growth, *Forage grasses, *Weeds, Arid lands, Weed control, Vegetation effects, Planting management, Seeds, Agronomic crops.
Identifiers: *India(Rajasthan).

Three species of forage producing perennial grasses are examined under various conditions of plant spacing and weeding. The grasses are Cenchrus ciliaris Linn., Lasiurus sindicus Henr. and Panicum antidotale Retz. Weeding once in the first year after establishment caused an increase in forage yield by 86, 120 and 284 percent respectively. The annual and perennial weeds causing the most problems are identified. The increase in forage production in attributed to the fact that the water formerly taken up by the weed is now available to the grass. Plant spacing did not significantly alter forage yield. Weeding seemed to be the predominant management variable, with two annual weedings offering the highest forage production. (See also W70-02554) (Muller-Arizona)
W74-07107

PROBLEMS IN DISTRIBUTION OF WATER RESOURCES IN THE ARID ZONE OF THE AMUDAR'YA RIVER BASIN (VOPROSY RASPREDELENIYA VODNYKH RESURSOV V ARISNOY ZONE (NA PRIMERE AMUDAR'I)),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4A.
W74-07192

SOLAR EVAPORATION CONTROLLED IRRIGATION SYSTEM,
For primary bibliographic entry see Field 2D.
W74-07211

IRRIGATION AND SPRINKLER SYSTEM,
Clemar Mfg. Corp., Azusa, Calif. Assignee.
D. R. Bayer, L. M. Ritchie, and J. A. Rivens.
U.S. Patent No 3,787,728, 7 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 918, No 4, p 1620, January 22, 1974.

Descriptors: *Patents, *Irrigation system, *Evaporation pans, *Sprinkler irrigation, *Environmental control, Rainfall, Frost, Winds, Heat, Equipment, Control systems, *Automation.
Identifiers: Sensors.

In an automatic water system water solenoid valves at a plurality of stations or locations may be sequentially and selectively energerized in accordance with two selectable programs: an irrigation program or mode and an environmental program or mode. Push button switches permit transition from one mode to the other. Use is made of evaporation pans, heat, frost, wind or rain sensors which are remotely controlled to activate the selected modes. The stations selected for watering in the irrigation mode may be different from those selected in the environmental mode. Automatic changeover from the irrigation to the environmental mode occurs in accordance with wind, heat or frost. For wind protection, crop cooling and frost protection and when the environmental program is completed the system automatically reverts back to the irrigation mode (except when the first switch is operated, in which case a manual reset operation is required). The irrigation mode has memory in that the irrigation unit resumes watering under the same conditions which existed at the time of transition from the irrigation to the environmental mode. In case of rain, both systems are rendered inoperative and require manual resetting. The irrigation mode incorporates means whereby compensation may be effected in accordance with evaporation conditions. (Sinha-OEIS)
W74-07212

LAND APPLICATION OF SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5D.
W74-07266

EFFECT OF IRRIGATION ON DYNAMICS OF MICROORGANISM QUANTITY IN DARK-BROWN SOILS IN SOUTHERN UKRAINE, (IN UKRAINIAN),
Akademiya Nauk URSR, Kiev. Inst. of Microbiology and Virology.
For primary bibliographic entry see Field 2G.
W74-07279

THE BITTERSWEET WATERS OF THE LOWER COLORADO,
R. Findley.
National Geographic, Vol 144, p 540-568, October 1973. 1 map, 9 photo.

Descriptors: *Dams, *Irrigation, *Salinity, *Flood control, *Water demand, Dam sites, Floods, Water supply, Drainage, Flow, Legal aspects, Rivers, *Colorado River, Deltas, Water utilization, Water, Water control, Irrigated land, Water sources, Colorado, California, Mexico.

Since the construction of Hoover Dam, the Colorado River is the most utilized and controlled river in the world, serving fifteen million people and generating a billion dollars worth of wealth. Legal conflicts have involved California, Arizona, Mexico and Indians as each attempts to obtain a larger allotment of the river's water. At the river's mouth is a wall of water, or tidal bore; the dams on the Colorado are causing the demise of this tidal bore. The delta channels are no longer purged of silt by periodic floods. But the water trapped by the dams irrigates thousands of acres of land. Technically, however, the water users along the river have overdrawn its supply, saved only by the slowness of the upper basin states to use their full allotment. Irrigation farmers flush its water through their soil, returning salty drainage back to the river. As one descends the lower Colorado, the water volume shrinks, and the salt content rises. The Colorado salinity question has become the largest issue between Mexico and the United States. Proposals to increase the flow of water in the Colorado include mining water from under California's Imperial Valley, and combing moisture from winter snow clouds over the Rockies. (Ritchie-Florida)
W74-07292

INFILTRATION AND WATER TABLE EFFECTS OF SOIL AIR PRESSURE UNDER BORDER IRRIGATION,
Agricultural Research Service, Reno, Nev. Soil and Water Conservation Research Div.
D. R. Linden, and R. M. Dixon.
Soil Sci Soc Am Proc. Vol 37, No 1, p 94-98, 1973. Illus.
Identifiers: *Infiltration, *Irrigation(Border), *Soil air pressure, *Water table.

Field studies investigated infiltration and water table responses to soil air pressure under border irrigation. The water table was depressed in the center and elevated near the edge of a border strip in response to differences in soil air pressure during an irrigation. Water table elevations also indicated that infiltration and subsequent groundwater recharge rates were greater in the vicinity of a border dike than at the center of the border. An infiltration response was measured by: venting soil air during an actual irrigation and pumping air into the soil during simulated irrigations. An actual border irrigation experiment indicated that displaced soil air pressure ha (expressed as equivalent heads of water) rising to values of 13-24 cm of water reduced infiltration over a 70-min period 14.3-10.3 cm. Simulated border irrigation experiments indicated that displaced soil air pressure ha must exceed surface head hs to have significant influence on infiltration and that the first few minutes of infiltration may determine the ha-to-hs relationship and subsequent infiltration effects. In the simulated irrigations with hs=6.3 cm, total infiltration in 1 hr was 6.0 and 1.5 cm when ha was 0 and 10 cm of water, respectively. Infiltration was only slightly reduced during the first 5 min when ha was 5 cm of water.--Copyright 1973, Biological Abstracts, Inc.
W74-07301

A MODEL OF IRRIGATED AGRICULTURE AND REGIONAL DEVELOPMENT IN SOUTHERN ARGENTINA: THE RIO NEGRO BASIN,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6A.
W74-07306

LAND DISPOSAL OF WASTEWATER--LITERATURE REVIEW FOR 1973,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5D.
W74-07327

PHOSPHORUS SUPPLY CHARACTERISTICS OF ACID ORGANIC SOILS AS MEASURED BY DESORPTION AND MINERALIZATION,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 2G.
W74-07345

STRUCTURAL CHANGES IN TROPICAL SOILS DUE TO ANIONS IN IRRIGATION WATER,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2G.
W74-07348

EFFECTS OF MOISTURE STRESS AT EARLY HEADING AND OF NITROGEN FERTILIZER ON THREE SPRING WHEAT CULTIVARS,
Department of Agriculture, Lethbridge (Alberta). Research Station.
S. Dubetz, and J. B. Bole.
Can J Plant Sci. Vol 53, No 1, p 1-5. 1973. Illus.
Identifiers: Cultivars, *Fertilizers, *Moisture stress, *Nitrogen, Spring, Tillering, Triticum-aestivum, *Wheat, Crop production.

Three cultivars of spring wheat (Triticum aestivum L.) were grown at 4 levels of N fertilizer in metal lysimeters protected from rain by an automatic rain shelter. A soil water stress of 8 bars was developed in 1/2 of the lysimeters at the early boot stage. Water stress reduced yield by severely decreasing the number of kernels per spike. Tillering was not affected and kernel weight was increased. 'Pitic 62' withstood the high stress better than 'Manitou' or 'Kenhi.' N enhanced yield by increasing tillering. Kernel weight was unaffected by N, and the number of kernels per spike was decreased. 'Pitic,' which had a higher number of kernels per spike, outyielded 'Manitou' and 'Kenhi.' The protein content of 'Manitou' was higher than that of the other 2 cultivars. The cultivars differed in their reaction to soil water stress and N.--Copyright 1973, Biological Abstracts, Inc.
W74-07351

EFFECTS OF WATER STRESS ON GROWTH AND NITROGEN-FIXING ACTIVITY OF TRIFOLIUM REPENS,
Dundee Univ. (Scotland). Dept. of Biological Sciences.
M. Engin, and J. I. Sprent.
New Phytol. Vol 72, No 1, p 117-126. 1973. Illus.
Identifiers: Age, Growth, *Meristematic activity, *Nitrogen fixation, *Soybean, Trifolium-repens, *Water stress.

The growth and N fixation of T. repens were investigated during the imposition of, and recovery from, different levels of water stress. Growth (measured as fresh and dry weight of roots and shoots, shoot length and N content) and N fixation (per plant and per unit weight of nodule) were depressed by application of water stress. The ability of plants to recover and the time taken for recovery were both related to the duration of the stress period. Meristematic activity in nodules was resumed after watering, making clover nodules more resistant to stress than plants, such as soybean, with spherical nodules. N fixation, estimated by the acetylene reduction technique, was compared with the total N content of plants. Differences between the estimated and actual N content varied with age and degree of water stress.--Copyright 1973, Biological Abstracts, Inc.
W74-07352

THE MICRO-METEOROLOGY OF AN EXTENDED AREA OF TEA BEFORE AND AFTER RAIN,
University of the West Indies, St. Augustine (Trinidad). Cocoa Research Unit.
R. Fordham.
Agric Meteorol. Vol 11, No 1, p 99-105. 1973. Illus.
Identifiers: Evaporation, Meteorology, Rainfall, Sensible, *Solar radiation, *Tea, *Malawi, *Microclimates, Crop canopy, Heat exchange.

Data are presented on the microclimate above the crop canopy of an extended area of mature tea growing in southern Malawi. Stomatal opening was significantly greater following the onset of the rainy season although the difference did not appear to affect the partitioning of solar radiation

between evaporation and sensible heat exchange as indicated by calculated values of the Bowen ratio.--Copyright 1973, Biological Abstracts, Inc.
W74-07354

THE EFFECT OF WATERLOGGING ON THE MINERAL NUTRIENT CONTENT OF TRIFOLIUM SUBTERRANEUM,
Department of Agriculture, South Perth (Australia).
A. C. Devitt, and C. M. Francis.
Aust J Exp Agric Anim Husb. Vol 12, No 59, p 614-617. 1972.
Identifiers: *Mineral nutrients, Trifolium-subterraneum, Trifolium-subterraneum-ssp-brachycal, Trifolium-subterraneum-ssp-subterran, Trifolium-subterraneum-ssp-yanninicu, *Waterlogging, *Clover.

Waterlogging affected the concentration and total content of nutrients in the leaves of 75 cultivars of the 3 subspecies of subterranean clover (T. subterraneum): yanninicum, subterraneum and brachycalycinum. In the plant tops the concentration of P, Fe, Mn and Cu increased; Zn was unaffected and N, K, Ca, Mg and Na decreased. Total leaf nutrient largely reflected differences in dry matter production. Fe content increased; N, P, K, Mg, Ca, Na and Zn decreased, but P and Mn content was unchanged. The results show a general pattern of subspecies differences in which the chemical composition of subspecies yanninicum was least affected by waterlogging, i.e., a result consistent with the overall better growth of this subspecies in waterlogged conditions.--Copyright 1973, Biological Abstracts, Inc.
W74-07355

OCCURRENCE AND DISTRIBUTION OF THE VINE PHYLLOXERA, PHYLLOXERA VITIFOLIAE (FITCH), IN THE OLIFANTS RIVER IRRIGATION AREA, NORTHWESTERN CAPE PROVINCE,
Plant Protection Research Inst., Pretoria (South Africa).
C. A. DeKlerk.
Phytophylactica. Vol 4, No 1, p 25-26. 1972. Illus.
Identifiers: Age, Distribution, Irrigation, Phylloxera, *Phylloxera-vitifoliae, Rivers, Soil types, *Vineyards, *South Africa(Olifants River).

Of 74 vineyards examined during a survey in South Africa, 18 were infested by the vine phylloxera, P. vitifoliae. Phylloxera were found in alluvial and Karoo soils but not in red sandy soils. Young vines are especially susceptible and the use of resistant rootstocks is recommended at future replantings.--Copyright 1973, Biological Abstracts, Inc.
W74-07356

A CONTRIBUTION TO THE BOTANY OF GANGANAGAR DISTRICT, NORTH RAJASTHAN,
Seth G. N. Khalsa Coll., Sri Ganganagar (India).
K. B. S. Dhillon, and P. S. Bajwa.
Bull Bot Surv India. Vol 11, No 3/4, p 234-244. 1969.
Identifiers: Botany, *Dicots, *India(Rajathan), Irrigation, Migration, *Monocots, *Pteridophytes, Weeds.

A preliminary account is presented of the monocots, dicots, and pteriodophytes of Ganganagar district, North Rajasthan (India). Floristically the district is an integral part of northwest Rajasthan, but with the introduction of canal irrigation, many new species have migrated into the area. There are 15 angiosperm species which are new reports for the state of Rajasthan. Ganganagar is a very important agricultural district and weeds of the local crops are indicated.--Copyright 1973, Biological Abstracts, Inc.
W74-07357

A STUDY OF THE INTAKE OF DRINKING WATER BY DAIRY COWS AT GRASS,
Hannah Dairy Research Inst., Ayr (Scotland).
M. E. Castle.
J Br Grassl Soc. Vol 27, No 4, p 207-210. 1972. Illus.
Identifiers: *Cows(Ayrshire), Dairy industry, Milk yield, *Potable water, *Grazing.

The average daily intake of drinking water of 2 groups of 10 spring-calved Ayrshire cows, 1 group on a paddock and the other on a Wye College system of grazing, was measured on 4 days/wk for 20 wk. Trends in water intake were similar on both systems, the average daily intake being 23.0 plus or minus 8.5 kg (5.1 plus or minus 1.9 gal)/cow. The average DM (dry matter) content of the herbage was 17.8% and the mean air temperature 13.4C (56.1F). The weight of water drunk was positively related to the daily milk yield and the DM percentage of the herbage, and negatively related to daily rainfall and relative humidity. All of these relationships were significant. Possible changes in the provision of water for dairy cows at grass are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-07358

PERFORMANCE OF LUCERNE (MEDICAGO SATIVA) LINES IN PURE STANDS UNDER IRRIGATED AND RAIN GROWN CONDITIONS IN SUB-COASTAL CENTRAL QUEENSLAND,
Department of Primary Industries, Brisbane (Australia).
D. G. Cameron, and J. D. Mullaly.
Aust J Exp Agric Anim Husb. Vol 12, No 59, p 646-652. 1972. Illus.
Identifiers: *Australia(Queensland), Environment, Irrigation, *Lucerne, Medicago-sativa, Nitrogen, Rain, Subcoastal areas, Subtropical conditions, *Crop production.

Seventeen lucerne lines were grown in 2 irrigated and 2 raingrown trials at Biloela, central Queensland(Australia). The cultivar 'Siro Peruvian' outyielded all the other cultivars during the first 2 yr. Seedling vigor, winter growth and regrowth after cutting were better in 'Siro Peruvian' than in 'Hunter River,' but it had shorter stand life and lower N content. 'African' gave similar annual yields to 'Hunter River' even though in seedling vigor, winter growth and rate of regrowth after cutting it was similar to 'Siro Peruvian.' The other lucerne lines were not adapted to the hot subtropical environment, and especially in the irrigated trials their yields or survival or both were much poorer than those of 'Hunter River.'--Copyright 1973, Biological Abstracts, Inc.
W74-07359

POLLUTION CAUSED BY AGRICULTURE,
Norges Veterinarhoegskole, Oslo. Institutt for Naeringsmiddelhygiene.
For primary bibliographic entry see Field 5B.
W74-07366

SOLUTIONS FOR LATERAL OUTFLOW IN PERFORATED CONDUITS,
Ghent Rijksuniversiteit (Belgium). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-07433

EFFECTS OF DRAINAGE ON THE YIELD OF CACAO, (IN PORTUGUESE),
Centro de Pesquisas do Cacau, Salvador (Brazil).
Z. Antonio Cadima, and De Tarso Paulo Alvim.
Rev Theobroma, Vol 2, No 2, p 27-32, 1972. Illus. English summary.
Identifiers: *Cacao, *Drainage, *Crop production.

Production data taken during a 5 yr period showed that the badly-drained areas produced 60% less than the moderately-drained one. The 'temporao' or mid-crop harvest (April-Aug) was higher than the 'safra' or main crop harvest (Sept-Jan) in the moderately-drained area; the opposite occurred in the badly-drained areas.--Copyright 1973, Biological Abstracts, Inc.
W74-07435

EFFECTIVENESS OF TWO NITRIFICATION INHIBITORS FOR ANHYDROUS AMMONIA UNDER IRRIGATED AND DRYLAND CONDITIONS,
Agricultural Research Service, Pullman, Wash. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 5G.
W74-07436

PORTABLE REFLECTANCE METER FOR ESTIMATING CHLOROPHYLL CONCENTRATIONS IN LEAVES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 7B.
W74-07437

AN IRRIGATION SCHEDULING MODEL WHICH INCORPORATES RAINFALL PREDICTIONS,
Auburn Univ., Ala. Dept. of Agricultural Engineering.
E. W. Rochester, and C. D. Busch.
Water Resources Bulletin, Vol 8, No 3, p 608-613, June, 1972. 5 fig, 5 ref. OWRR A-025-ALA(2).

Descriptors: Irrigation, *Scheduling, *Irrigation practices, Supplemental irrigation, Soil moisture, Evapotranspiration, Consumptive use, Agricultural engineering, Mathematical modeling, Computer models, *Forecasting, *Rainfall.
Identifiers: *Irrigation scheduling.

In humid areas appreciable amounts of rainfall complicate irrigation scheduling. This rainfall tends to give supplemental water application a low priority. Irrigation may be delayed until there is not enough time to cover the crop area before some drought damage occurs. To improve the management of irrigation systems, a scheduling model has been developed. The model's water application decisions incorporate climatological records, soil-plant data, current pan evaporation and rainfall, the number of fields to be irrigated, and 5-day weather forecasts. The model updates the soil moisture conditions, predicts impending water depletion, and if supplemental water is needed both the field priority and amounts to be applied is indicated for each of the next 5 days. Errors introduced through the use of forecasts and long-term pan evaporation records have been slight because of the tri-weekly updating. Also natural rains which restore the root zone to maximum water holding capacity prevent long-term bias. (Skogerboe-Colorado State)
W74-07440

SHALLOW DRAIN PERFORMANCE IN A HEAVY SOIL,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 4A.
W74-07442

NITRATE CONCENTRATIONS IN THE UNSATURATED ZONE BENEATH IRRIGATED FIELDS IN SOUTHERN CALIFORNIA,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W74-07445

EFFECTS OF SUBSURFACE ASPHALT LAYERS ON CORN AND TOMATO ROOT SYSTEMS,
Florida Univ., Gainesville. Dept. of Soil Science.

G. K. Saxena, L. C. Hammond, and W. K. Robertson.
Agronomy Journal, Vol 65, No 2, p 191-194, March-April, 1973. 3 fig, 2 tab, 13 ref.

Descriptors: *Root systems, *Root zone, *Asphalt, Barriers, Root distribution, *Corn field, *Tomatoes, Crop response.

This study was initiated to determine the nature and reason of any influence of a subsurface asphalt layer on root growth and distribution in the soil profile. Observations of root distributions of sweet corn and tomato were made in freshly dug pits. Root sections in and out of the asphalt layer were photographed and examined microscopically for morphological effects. The 'line-intercept' method was used to obtain quantitative measurements of root concentration of field corn. Tomato roots in the asphalt layer were larger in diameter and showed damage to cells in the cortex. Rooting of all crops was less extensive in soil below the asphalt layer than in soil at the same depth without the asphalt. Concentration of corn roots in the top 60 cm of soil averaged 1.6, 1.7, 2.0, and 2.2 cm/cc for the following respective treatments: control, control with irrigation, asphalt layer, and asphalt layer with irrigation. (Skogerboe-Colorado State)
W74-07447

LEACHING LOSSES OF SULFUR DURING WINTER MONTHS WHEN APPLIED AS GYPSUM, ELEMENTAL S OR PRILLED S,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 5B.
W74-07449

TRICKLE IRRIGATION IN AUSTRALIA,
J. Milne.
Irrigation Journal, Vol 23, No 6, p 21, November-December, 1973. 1 fig.

Descriptors: *Irrigation practices, *Surface irrigation, Application equipment, Soil moisture, Horticulture, *Australia.
Identifiers: *Trickle irrigation, Irrigation scheduling.

A brief history of trickle irrigation in Australia is given. The use of irrigation scheduling in the operation of the trickle system is also noted. (Skogerboe-Colorado State)
W74-07450

IRRIGATION SURVEY.
Irrigation Journal, Vol 22, No 6, p 9-18, November-December, 1972.

Descriptors: Irrigation, *Irrigation practices, Irrigation systems, *Surveys, *United States, *Sprinkler irrigation, Irrigated land.

A state-by-state summary is presented of irrigated acreage for selected years since irrigation was begun in each state. The following is also given: percent change per year, amount sprinkled, type of power used by percent, method of irrigation, irrigated acreage by crop, and amount irrigated by gravity. (Skogerboe-Colorado State)
W74-07451

PLANT AND IRRIGATION WATER REQUIREMENTS,
K. R. Frost.
Irrigation Journal, Vol 23, No 6, p 10, November-December, 1973.

Descriptors: Soil-water-plant relationships, *Crop response, Evapotranspiration, Soil moisture, Soil water, Soil chemistry, *Water utilization, *Irrigation practices.
Identifiers: *Irrigation scheduling.

A brief, descriptive outline of the factors affecting crop water use is presented. A description of the irrigation scheduling processes is given. (Skogerboe-Colorado State)
W74-07452

LIVEWEIGHT GAINS OF SHORTHORN STEERS ON NATIVE AND IMPROVED PASTURES AT ADELAIDE RIVER NORTHERN TERRITORY,
Northern Territory Administration, Darwin (Australia). Animal Industry and Agriculture Branch.
R. N. Wesley-Smith.
Aust J Exp Agric Anim Husb, Vol 12, No 59, p 566-572, 1972. Illus.
Identifiers: *Australia(Adelaide River), *Pastures, Rivers, *Cattle(Shorthorn steers), Liveweight gain(Cattle).

Data from over 40 grazing trials conducted with Shorthorn steers during 1961-1968 in a tropical monsoonal climate, mean rainfall about 127 cm, at Adelaide River, Northern Territory, Australia, are presented. The average yearly liveweight gain on native pasture at 1 beast to 4-8 ha was 18 kg, due to gains in Nov.-Dec. but weight maintenance or loss occurred during most of the year. The average yearly liveweight gain on Townsville stylo based pastures at 1 beast to 0.4-1.2 ha was 95 kg, with gains of about 0.5 kg/day in the wet season and weight maintenance in the dry. These results are lower than those reported for Katherine, Northern Territory. Other pastures, including phasey bean, were also useful. Some evidence is presented of compensatory gain, and of a comparison of Brahman crossbred steers with the Shorthorns. Possible reasons for the better performance by steers at Katherine compared to Adelaide River are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-07453

AMMONIUM AND NITRATE UPTAKE BY CORN (ZEA MAYS L.) AS INFLUENCED BY NITROGEN CONCENTRATION AND NH4(+)/NO3(-) RATIO,
Michigan State Univ., Lansing.
D. D. Warncke, and S. A. Barber.
Agronomy Journal, Vol 65, p 950-953, 1973. 1 fig, 5 tab, 16 ref. OWRR B-026-IND(2).

Descriptors: *Farm management, *Absorption, *Nitrates, *Ammonium, *Corn(Field), Soil-water-plant relationships, Nitrogen compounds, *Nitrification, Nutrients.
Identifiers: Shoot/Root ratio, Plant weight, Uptake coefficient, Ammonium/Nitrate ratios.

Corn absorbs both ammonium and nitrate forms of N. The relative proportion of the two can be controlled by affecting nitrification. Little is known about the relative rates of absorption of these ions or their effect on plant growth when both are present. Investigations were made in nutrient solutions with 5 N concentrations at each of 5 ammonium/nitrate ratios. Maximum dry matter accumulated with an N concentration of 67 millimoles. Maximum N uptake occurred for the combination of 303 millimoles N and ammonium/nitrate ratio of 2.46. Shoot/root ratio increased significantly with increased N concentration but was unaffected by the ammonium/nitrate ratio. There was no significant difference between ammonium and nitrate in their relative rates of absorption. Increasing the concentration of ammonium reduced the nitrate rate and increasing the nitrate concentration reduced the ammonium uptake rate.
W74-07459

EFFECT OF IRRIGATION WITH THERMAL WATER ON TRACE-ELEMENT CONTENT IN SOME SOILS OF GEORGIA (VLIYANIYE OROSHENIYA TERMAL'NYMI VODAMI NA SODERZHANIYE MIKROELEMENTOV V NEKOTORYKH POCHVAKH GRUZII),
F. N. Gelashvili.
Pochvovedeniye, No 4, p 80-86, April 1973. 2 tab, 17 ref.

Descriptors: *Land reclamation, *Irrigation practices, *Thermal water, *Trace elements, *Soil types, Nutrients, Corn(Field).
Identifiers: *USSR(Georgian SSR).

The amount of thermal water used for irrigation in eastern Georgia during the growing season was 2,700 cu m/ha in 1967, 3,200 cu m/ha in 1968, 2,800 cu m/ha in 1969, and 3,100 cu m/ha in 1970. In western Georgia, because of wetter climate, irrigation rates were less--1,980 cu m/ha in 1967, 2,750 cu m/ha in 1968, 2,000 cu m/ha in 1969, and 2,580 cu m/ha in 1970. Thermal-water irrigation of Meadow-Alluvial and Red Earth-Podzolic soils of Georgia increases the content of available forms of macro- and microelements, which generally promotes nutrient accumulation in the upper part of the profile. Trace-element availability in soils irrigated with thermal water depends not only on pH and natural oxidation-reduction conditions but also on degree of soil wetting by geothermal waters at a temperature of 25-28 deg C. Trace-element availability depends also on the addition to soil of dissolved trace elements, which tend to intensify biochemical reactions, create readily assimilable forms of nutrients and to improve conditions for plant vital activity. Accumulation and quantitative redistribution of nutrients in soil planted to corn depend on chemical composition of thermal waters, soil physicochemical properties, and on variety, spacing, and stage of development of plants. Phosphorus, potassium, and nitrogen accumulate in soils irrigated with thermal water. Ca and CO3 entering the soil tend to neutralize the acidic reaction of Red Earth-Podzolic soils, creating the conditions necessary for growth, development, and increased yield of corn. Thermal-water irrigation increases corn grain yield from 32% to 80% as compared with the control, depending on soil and climatic conditions, variety of the corn, and chemical composition of the thermal water. The yield doubles on an irrigated plot as compared with the control, and the growing season is shortened, on the average, by 20-25 days. (Josefson-USGS)
W74-07508

SOIL MOISTURE DYNAMICS AND ITS VARIATIONS IN SOILS UNDER FIELD CROPS (DINAMIKA VLAZHNOSTI I STEPEN' YEYE VAR'IROVANIYA V POCHVAKH POD POLEVYMI KUL'TURAMI),
Kostromskoi Selskokhozyaystvennyi Institut (USSR).
For primary bibliographic entry see Field 2G.
W74-07509

INVESTIGATION OF THE RELATION OF GROUNDWATER EVAPORATION TO LITHOLOGICAL STRUCTURE OF THE ZONE OF AERATION (K IZUCHENIYU ZAVISIMOSTI ISPARENIYA GRUNTOVYKH VOD OT LITOLOGICHESKOGO STROYENIYA ZONY AERATSII),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 2D.
W74-07529

WATER RELATIONS OF WHEAT AS AFFECTED BY IRRIGATION AND NITROGEN FERTILIZATION,
Lincoln Coll. (New Zealand). Dept. of Plant Science.
C. T. Dougherty.
N Z J Agric Res. Vol 16, No 1, p 12-18, 1973.
Identifiers: Fertilization, *Irrigation, Leaf, *Nitrogen fertilization, Transpiration, *Wheat.

Water potentials of flag leaves and ears on the same tiller of Kopara wheat were measured soon after ear emergence by a pressure-bomb technique. Water potentials of ears were nearly 0.5 bar higher than those of flag leaves. At soil water levels (0-15 cm) of 20%, water potentials of -8 to -9 bars were recorded at 9:00 a.m. on a day of high solar radiation with relatively little advective heat point, and the water potentials of the ears were lower than -20 bars. N fertilizer had no direct effect on ear water potential, but in non-irrigated wheat it depleted soil water, probably by increasing leaf area index and transpiration. As a result soil water levels in non-fertilized, non-irrigated plots were well above the wilting point, and the water potentials of the ear of wheat growing in them were similar to those which were irrigated.--Copyright 1973, Biological Abstracts, Inc.
W74-07596

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

A STUDY OF POTENTIAL INSTITUTIONAL ARRANGEMENTS FOR WATER QUALITY AND WATER RESOURCES (QUANTITY) PLANNING AND MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W74-07051

LANDSCAPE COMPARTMENTALIZATION: AN ECOLOGICAL APPROACH TO LAND USE PLANNING,
Duke Univ., Durham, N.C. School of Forestry.
For primary bibliographic entry see Field 6G.
W74-07053

WALLOWA LAKE BASIN COMPREHENSIVE PLAN.
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
For primary bibliographic entry see Field 5D.
W74-07065

BACKGROUND SURVEY. SURFACE DRAINAGE PROGRAM, MADISON, SAINT CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
Available from the National Technical Information Service as PB-222 504, $7.25 in paper copy, $1.45 in microfiche. Final report prepared for Department of Housing and Urban Development, April 1973. 90 p, 21 fig, 9 tab, 117 ref. WRC-Ill. Title III.

Descriptors: *Illinois, *Flood protection, *Flood damage, *Drainage systems, *Drainage water, Management, Hydrologic data, Drainage patterns, Drainage effects, Surface runoff, River basin development, Flood plain zoning, Storm runoff, Storm water.
Identifiers: *Regional planning, Randolph County(Ill), Monroe County(Ill), St. Clair County(Ill), Madison County(Ill).

The purpose of a drainage program for Southwestern Illinois (Madison, Monroe, St. Clair, and Randolph Counties) is to identify and analyze drainage and flooding problems and formulate solutions for future implementation. Information concerning the physical and hydrological character of the region, storm drainage water, and flood control for major hydrological units, and agencies responsible is first collected. Results of the initial information survey are presented. Drainage and flood damage control has been accomplished by structural measures, whereas nonstructural measures, such as flood plain zoning, have not been used. Three river systems, the Mississippi, Kaskaskia, and Mary's, make up the surface water resource and natural drainage system, but information is scarce for smaller bodies of water. The magnitude of drainage problems and frequency of urban flooding points to a need for land use management principles. Drainage systems must be designed to accommodate future as well as existing needs, requiring increased knowledge about area-wide development. An immediate need for a comprehensive surface drainage planning program to insure coordination among federal, state, and local projects is evident; its implementation will comprise the remainder of the program. (Grden-North Carolina)
W74-07066

THE RELATIONSHIP OF LAND USE TO WATER USE IN SAN ANTONIO, TEXAS,
Texas Univ., Austin. Center for Research in Water Resources.
D. R. Young, and J. F. Malina, Jr.
Technical Report EHE-72-2, CRWR-84. May 1972. 38 p, 9 fig, 24 ref, 1 append. EPA 5T2-WP-183-03,04.

Descriptors: Water management(Applied), *Land use, *Water utilization, *Water consumption, *Water demand, *Texas, Municipal water, Industrial water, Water distribution, Water delivery, Water supply, Water control, *City planning, Planning.
Identifiers: *San Antonio(Tex), Land use planning, Housing density, Housing valuation, Employee concentrations.

A methodology for estimating the relationship between water use and land use in a metropolitan area is developed, based on data from San Antonio, Texas. Water use for 1963 through 1970 was evaluated in regard to housing density, median housing valuation, and employee concentration. When average water use data were correlated with those land use parameters, results showed water consumption in an urban area is a function of land use. Population is the most important factor affecting water use, with household density serving as an adequate predictor. Employee density showed the effect of commercial and industrial activity upon water use, since water sales by the City Water Board were not categorized by household, commercial, and industrial use. Water use is also a function of the consumers' economic level, and housing value exemplifies this. Water use and total annual rainfall are related, but more information is needed concerning the effects of rainfall upon amount of lawn sprinkling. Planners must predict future housing densities, commercial and industrial centers, and economic level changes to plan water supply resources and distribution systems. Zoning is recommended to enforce and establish land use patterns which insure adequate resources and systems. (Grden-North Carolina)
W74-07067

URBAN IMPACTS OF RURAL RESOURCE DEVELOPMENT EXPENDITURES IN THE INTERLAKE AREA OF MANITOBA,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 6B.
W74-07068

A FRAMEWORK FOR ECONOMIC PLANNING OF WATERSHED DRAINAGE,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
G. A. Norton, and J. A. MacMillan.
Research Report No. 6, 1972. 63 p, 2 fig, 8 tab, 45 ref.

Descriptors: *Canada, *Watershed management, Drainage, *Drainage areas, *Drainage basins, *Project planning, *Project benefits, Drainage district, Watersheds, Drainage effects, Drainage programs, Drainage engineering, Administration, Feasibility, Project purposes, Water conservation, Water resources development.
Identifiers: Interlake Area(Manitoba), Public investment, Public project expenditures, Manitoba(Canada).

A theoretical framework for drainage planning, synthesizing biological, engineering, economic, and institutional concepts; the relationships among drainage inputs, resource modification, and economic welfare; and evaluation of impacts of drainage expenditures for the Interlake Area of Manitoba, Canada, are objectives for this study on a farm level economic evaluation of drainage. Efficiency criterion show changes in private income that occur per unit of public project expenditure, and distribution criterion identify effects on income groups and their geographic location. Results show farmers believe drainage is beneficial due to the Provincial Government's drainage subsidy program, and some communities are quite dependent on their infrastructure drainage components. Such information aids in watershed management and in the allocation of public funds among resource expenditure categories. When deciding whether to drain a watershed, information concerning future demand for food, desirability of drainage (opportunity cost of providing food in other ways), the land's suitability for drainage, and profitability of drainage is needed. The formulation of a decision process based upon a comprehensive evaluation method is often constrained by existing institutional structures. Institutions with a favorable impact on welfare and the ability to view the watershed as part of an ecosystem constitute a favorable structure. (Grden-North Carolina)
W74-07069

PUBLIC INVESTMENT CRITERIA: APPLICATION TO A PROJECT IN THE SOURIS RIVER BASIN,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 6B.
W74-07070

FLOOD PLAIN INFORMATION-NEUSE AND TRENT RIVERS AND JACK SMITH CREEK, NEW BERN, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
May, 1969. 50 p, 10 fig, 11 plates, 2 tab.

Descriptors: Floods, *Flood damage, Tidal effects, *Saline water barriers, *Hurricanes, *Flood control, Flood peak, Flood flow, *North Carolina.
Identifiers: *Tidal floods, Hurricane 'Ione', Standard Project Tide Flood, Intermediate Regional Tide Flood, *New Bern(N.C.), Neuse River(N.C.), Trent River(N.C.), Neuse River Estuary(N.C.).

While New Bern, North Carolina, is subject to both fresh-water flooding and salt-water tide flooding, abnormal rises in tides in the Neuse River estuary are the primary causes of flood damage. Approximately 57% of New Bern is vulnerable to flooding, due to low elevations ranging from 10 to 15 feet above mean sea level. The greatest tide flood was caused by Hurricane 'Ione' in 1955. Flood waters rose to 10.6 feet above mean sea level, accompanied by wind gusts up to 80 miles per hour and a rainfall of 12.23 inches in 24 hours. Analysis indicates that an Intermediate Regional Flood of the tide type would be about 1.4 feet higher than the Hurricane 'Ione' tide flood. A Standard Project Tide Flood would be about 2.4 feet higher than the Intermediate Regional Tide Flood. A flood-tide-barrier project across the Neuse River estuary and located 18 miles below New Bern was authorized for construction by

Congress in 1965 to provide against hurricane-tide flooding in New Bern and vicinity. By 1969 however, no funds were appropriated for the project. The barrier would be a 10,400-foot-long, dredge fill structure, with side slopes of 1 vertical to 30 horizontal, a crest elevation of 16 feet above mean sea level, and a crest width of 50 feet. When constructed, it would reduce the elevation of a tide flood equal to the 1955 record tide flood from 10.6 feet mean sea level to about 5.4 feet mean sea level. Reduction of the Intermediate Regional Tide Flood would be 6.2 feet, from 12.0 feet mean sea level to about 5.8 feet mean sea level. (Hoffman-North Carolina)
W74-07073

FLOOD PLAIN INFORMATION-NEUSE RIVER AND BUFFALO CREEK, SMITHFIELD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
August, 1971, 58 p, 9 fig, 13 plates, 15 tab.

Descriptors: Floods, *Flood damage, *Dams, *River regulation, *Flood control, Flood peak, Flood profile, Flood flow, *North Carolina.
Identifiers: Falls Lake(N.C.), Standard Project Flood, Intermediate Regional Flood, Neuse River(N.C.), Buffalo Creek(N.C.), *Smithfield(N.C.).

Smithfield, North Carolina lies in the middle of the Neuse River drainage basin. Neuse River and Buffalo Creek converge on the northern edge of town; together they form the western and northern town limits. Approximately 56%, or 1,265 acres, of the town is subject to flooding from major floods on these streams. This area includes the town's water treatment and sewage treatment plants. Analysis indicates that Intermediate Regional Floods would attain depths of about 19 feet above bankfull on the Neuse River and about 10 feet above bankfull on Buffalo Creek. This would result in the flooding of 485 acres and 40 structures within the town limits. Standard Project Floods would generally be 18 to 19 feet higher than Intermediate Regional Floods, resulting in flooding of the entire flood plain and the 830 structures located on it. Maps, profiles and cross sections detail the extent of past floodings and possible future flooding. With this information, minimum floor levels for buildings for control of flood damage can be determined. Falls Lake, to be located 47 miles upstream from Smithfield on the Neuse River, will control 63% of the drainage area above Smithfield. The project will have a maximum regulating effect on flood stages at Smithfield of about 3.5 feet. (Hoffman-North Carolina)
W74-07074

FLOOD PLAIN INFORMATION: BURDENS AND TWO BOTTLE CREEKS AT RESEARCH TRIANGLE AREA, DURHAM COUNTY, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
June, 1972. 21 p, 7 fig.

Descriptors: *Floods, *Flood damage, *Flood profiles, Flood peak, Flood flow, *North Carolina.
Identifiers: Intermediate Regional Flood, Standard Project Flood, Burdens Creek(N.C.), Two Bottle Creek(N.C.), Research Triangle Area(N.C.).

Burdens Creek is a main tributary of Northeast Creek. It rises in the south central part of Durham County and flows in a southwesterly direction through the Research Triangle Park, North Carolina. This report covers Burdens Creek from its confluence with Northeast Creek to N.C. Highway 54, a distance of 2.12 miles. Also included is Two Bottle Creek, a tributary of Burdens Creek. Two Bottle Creek enters Burdens Creek 1.34 miles from Northeast Creek. The study covers the .53 mile section south of N.C. Highway 54. No flood discharge or stage records are available for either creek. Determination of flooding potential in the Burdens Creek and Two Bottle Creek area is therefore based on data on streams with similar geographical and physiographical characteristics. Maps, profiles and cross sections delineate the extent of possible flooding. At the present time land-use along the creeks is 20% agricultural and 80% woodland. The only facilities that would be affected by flooding are highway bridge crossings. The Intermediate Regional Flood would flood one highway crossing and the Standard Project Flood would overflow five. (Hoffman-North Carolina)
W74-07075

FLOOD PLAIN INFORMATION - GLADE CREEK, VINTON, VIRGINIA.
Army Engineer District, Wilmington, N.C.
December, 1971. 35 p, 5 fig, 11 plates, 7 tab.

Descriptors: Floods, *Flood profiles, *Flood damage, Flood peak, Flood flow, *Virginia.
Identifiers: *Intermediate Regional Flood, *Standard Project Flood, Glade Creek(Va.), *Vinton(Va.).

Records pertaining to floods and flood damage along Glade Creek in Vinton, Virginia are extremely scarce. Based on an analysis of intense rainfall data, it was estimated that floods have occurred at a rate of nearly 1 every 3 years. Contour maps, profiles and cross sections indicate the extent of past flooding and potential future flooding. A Standard Project Flood would cause flood stages from about 12 to 20 feet higher than bankfull stages, depending on location. This would flood approximately 420 structures within a 585 acre area. An Intermediate Regional Flood would cause flood stages from about 4 to 11 feet higher than bankfull stages, also depending upon location. This would flood approximately 100 structures within a 388 acre area. (Hoffman-North Carolina)
W74-07076

INTERIM STORM DRAINAGE PLAN REPORT-LITTLE ROCK-NORTH LITTLE ROCK METROPOLITAN AREA.
Metroplan, Little Rock, Ark.
For primary bibliographic entry see Field 5D.
W74-07082

STUDY DESIGN. SURFACE DRAINAGE PROGRAM, MADISON, ST. CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
Available from the National Technical Information Service as PB-222 487; $6.25 in paper copy, $1.45 in microfiche. Final report. No SWIL-MAPC 73-11. June, 1973. 74 p, 4 fig. HUD-Ill-P 317-2-275.

Descriptors: *Flood control, Surface drainage, *Surface runoff, *Watershed management, *Comprehensive planning, River basin development, Drainage, Runoff, Urban runoff, *Illinois, Water control, Abatement, Flood damage, Storms, Watersheds, Drainage area, Drainage effects, Water quality, Environmental control, Environmental effects, Regional development.
Identifiers: *Surface drainage program, *Illinois, Madison County(Ill), St. Clair Co.(Ill), Monroe Co.(Ill), Randolph Co.(Ill).

This comprehensive drainage and flood abatement planning program provides techniques and guidelines needed to formulate and implement solutions for drainage problems found in the 2,375 square miles within the political boundaries of Madison, St. Clair, Monroe and Randolph Counties, Illinois, which (except for Randolph) comprise part of the St. Louis Metropolitan Area. Political boundaries are disregarded in order to consider total watershed surface drainage planning. The Planning Area lies within the basins of the Mississippi, the Kaskaskia and Mary's Rivers divided into ten sub-basins. Urbanized centers range in size from small outlying communities with less than 500 to conglomerate urbanized areas with populations exceeding 150,000 in the northwestern quadrant. A detailed description of methodology, a description of work activities and information required, and a detailed model of the plan development process are provided. Various planning and engineering tasks to be carried on during the program are outlined in terms of objectives, scope and content description, input, output, staff skills needed, and time element. Cost estimates, flow charts of work activities and scheduling, and other information are provided. An effort will be made to coordinate this program with related water resources activities and programs of other agencies. (Grden-North Carolina)
W74-07083

STATE FLOOD CONTROL PROGRAM.
Arizona Water Commission, Phoenix.
Report No 3, March 1973, 40 p. 5 fig, 6 tab.

Descriptors: *Building codes, *Zoning, *Project planning, *Flood control, Cost analysis, Floods, Flood plain zoning, Alluvial fans, Arizona, Flood damage, Civil engineering, Check structures, Flood plains, Water management(Applied), Water policy, Hydraulic structures, Dams.

Since much of the land which Arizonans use to live and work is subject to frequent flooding, a comprehensive flood control program is required. Floodplains and alluvial fans are the two principal landforms subject to inundation which support the vast majority of the population. A two-fold program is required to meet the flood control needs of Arizona. The first phase, involving the physical protection of development which has already been established in floodprone areas, identified these areas and proposes flood control measures which will cost in the excess of $400 million. The second phase of the Arizona flood control program must protect areas not yet developed, by proper zoning, building regulations, and planning. The first of these considerations is emphasized. A total of 47 projects are identified and a short description and recommendation for each is given. Legislative recommendations and acts associated with the flood control program proposition are presented in an appendix. The economics, method of payment and costs of the projects are included. (Muller-Arizona)
W74-07111

CALCASIEU RIVER AT COON ISLAND, LOUISIANA, SHIP CHANNEL (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8A.
W74-07118

HAWAII'S STATEWIDE LAND CLASSIFICATION PROVES ADAPTABILITY AS LAND USE AND ENVIRONMENTAL CONCERNS CHANGE,
Hawaii State Land Study Bureau, Honolulu.
H. L. Baker.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 77-81,

Descriptors: *Hawaii, *Land classification, *Land use, *Water quality, Zoning, Decision making, Urbanization, Agriculture, Productivity, Land development, Economics, Planning.
Identifiers: *Land types, *Land categories, Oahu(Hawaii), Maui(Hawaii).

To meet the challenge of growing demands on its limited land resources Hawaii has created a statewide land classification system which inventories the suitability of existing resources for agricultural suitability and productivity. The system groups land into homogeneous units known as land types,

describes their physical conditions and environment, delineates the land type units utilizing areal photos and rates land according to its productivity under alternative uses. While the study appears to have been initially developed to handle problems in agricultural development, such elements as slope, stoniness, depth of soil and drainage are also useful in making urban development decisions. As a result, a classification system of urban land has arisen from data collected under the statewide survey. The existing system has already proved to be a useful tool in the development of statewide zoning, local community development, and in recent re-evaluation of specific urban-use suitability of lands within the urban zone as defined under the State Land Use Law. (See also W74-07133) (Schroeder-Wisconsin)
W74-07138

WATER USES AND WATER DEVELOPMENT IN FALL CREEK--POSSIBLE CONFLICTS,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
For primary bibliographic entry see Field 6B.
W74-07149

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: I. OBSERVATIONS DURING FLOODING AND DRYING,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 2G.
W74-07151

MANGANESE AND IRON SOLUBILITY CHANGES AS A FACTOR IN TILE DRAIN CLOGGING: II. OBSERVATIONS DURING THE GROWTH OF COTTON,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 2G.
W74-07152

DRAINAGE DENSITY AND EFFECTIVE PRECIPITATION,
For primary bibliographic entry see Field 2A.
W74-07155

WATER YIELD, ANNUAL PEAKS AND EXPOSURE IN MOUNTAINOUS TERRAIN,
Forest Service (USDA), Moscow, Idaho. Forestry Sciences Lab.
For primary bibliographic entry see Field 2A.
W74-07165

NUMERICAL STUDIES OF TWO-DIMENSIONAL SATURATED-UNSATURATED DRAINAGE MODELS,
Oslo Univ. (Norway). Inst. of Geophysics.
For primary bibliographic entry see Field 2G.
W74-07168

THE FORECASTING OF STREAMFLOW USING THE METHOD OF CHARACTERISTIC MODES,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
E. D. Soulis, and W. C. Lennox.
Journal of Hydrology, Vol 20, No 4, p 341-350, December 1973. 2 fig, 3 tab, 9 ref. Canada NRC Grant A3726.

Descriptors: *Streamflow forecasting, *Statistical methods, Stochastic processes, Correlation analysis, Time series analysis, Algorithm, Optimization.
Identifiers: *Farmers method(Characteristic modes).

Streamflow forecasting was studied using the method of characteristics modes proposed by Farmer for nonstationary processes. The calculation of the autocorrelation matrix was modified for processes which generate a single record. An algorithm is proposed for the optimum choice of the number of past data and mode vectors. Results for 12 gaging stations in various parts of the world are presented. (Knapp-USGS)
W74-07178

A SYNTHETIC MODEL FOR DAILY STREAMFLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W74-07179

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1973.
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 7C.
W74-07188

HYDROELECTRIC POWER RESOURCES OF THE UNITED STATES, DEVELOPED AND UNDEVELOPED, JANUARY 1, 1972.
Federal Power Commission, Washington, D.C.
For primary bibliographic entry see Field 8C.
W74-07189

PROBLEMS IN DISTRIBUTION OF WATER RESOURCES IN THE ARID ZONE OF THE AMUDAR'YA RIVER BASIN (VOPROSY RASPREDELENIYA VODNYKH RESURSOV V ARISNOY ZONE (NA PRIMERE AMUDAR'I)),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
A. A. Bostandzhoglo.
Vodnyye Resursy, No 5, p 55-67, 1973. 1 fig, 10 tab, 7 ref.

Descriptors: *Water resources, *Water distribution(Applied), *Arid lands, *Irrigation, Irrigation systems, Irrigated land, Water utilization, Agriculture, Cotton, Mathematical studies, Optimization, Economics.
Identifiers: USSR, *Soviet Central Asia(Amudar'ya River basin).

The major water user in Soviet Central Asia today and in the years ahead is irrigated agriculture, which will soon cover 7 million ha in the Kirgiz, Tadzhik, Uzbek, and Turkmen Republics. Land suitable for irrigation in Soviet Central Asia is about 26 million ha, including 13.5 million ha in the Syrdar'ya basin and 12.5 million ha in the Amudar'ya basin. Land cropped to cotton is about 2.8 million ha, representing more than 95% of all cotton produced in the USSR. Water resources in basins of Soviet Central Asian rivers in an average water year are about 120 cu km, including 80 cu km in the Amudar'ya system and 40 cu km in the Syrdar'ya system. River runoff in the Syrdar'ya basin can be used to irrigate 3 to 3.5 million ha, and river runoff in the Amudar'ya basin, 5 to 5.2 million ha. Based on investigations in the Amudar'ya basin and use of mathematical programming techniques, a working method was proposed and a solution obtained for an optimization problem on water-resource distribution among different water users. Results of optimization computations were compared with data obtained earlier in a general program for complex use of water resources of the Amudar'ya River. Procedures recommended for distribution of limited water resources can be used to solve similar problems for any region where irrigation merits prior attention. (Josefson-USGS)
W74-07192

OPTIMAL LINEAR EXTRAPOLATION OF LEVEL FLUCTUATIONS OF CLOSED WATER BODIES (OPTIMAL'NAYA LINEYNAYA EKSTRAPOLYATSIYA KOLEBANIY UROVNYA ZAMKNUTYKH VODOYEMOV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
V. Ye. Prival'skiy.
Vodnyye Resursy, No 5, p 17-28, 1973. 2 fig, 23 ref.

Descriptors: *Lakes, *Water level fluctuations, *Statistical methods, Statistical models, Stochastic processes, Forecasting, Inflow, Evaporation, Circulation, Equations.
Identifiers: *USSR(Caspian Sea).

A method is presented for optimal linear extrapolation of regular random processes based on their parametric models. A method is described for constructing these models, based on estimates of correlation and partial correlation functions of the process. The problem of forecasting level fluctuations of a closed water body from a water-balance equation is examined within the framework of the theory of random processes, and a long-range forecast is made of level fluctuations of the Caspian Sea to the year 2000, provided the present level of irretrievable water losses in the sea basin is maintained. An approximate stochastic model was constructed of fluctuations of visible evaporation from the sea surface for 1890-1969. Changes in stochastic models of inflow and visible evaporation were found to have little effect on the results of the long-range forecast. The need to construct a physical model that relates level fluctuations of the Caspian to large-scale air and ocean circulation processes and their effects is noted. (Josefson-USGS)
W74-07195

THE BITTERSWEET WATERS OF THE LOWER COLORADO,
For primary bibliographic entry see Field 3F.
W74-07292

AGANA SMALL BOAT HARBOR, AGANA, GUAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
Available from the National Technical Information Service as EIS-PI-73-0847-F; $4.75 in paper copy, $1.45 in microfiche. February 23, 1973. 39 p, 4 fig.

Descriptors: *Environmental effects, *Harbors, *Aquatic habitats, Construction, Aquatic life, Reefs, Wastes, Oil spills, Water supply, Fish, Wildlife, Navigation, Coastal structures, Shore protection.
Identifiers: *Environmental Impact Statements, *Guam(Agana).

The project under consideration is the construction of a small boat harbor in Agana, Guam. Implementation of the proposed plans will alter the existing shallow reef. The proposed harbor would improve boating conditions and enhance recreational uses. The impact upon marine life will be limited to construction periods. No rare or endangered species nor any areas of historical significance will be affected. Some of the adverse environmental effects are various short-term impacts during construction, use of 40 acres of reef flat habitat, and possible conflicts of use among boaters, surfers, and fishermen. Three alternatives; alternative sites, alternate harbor configuration, or no action at all. The responsibilities for control of harbor pollution from fuel and oil spills and ship wastes rest with the local interests. The following protected uses will come from the harbor: industrial water supply, propagation of fish and other aquatic life, esthetic enjoyment, recreation, and navigation. (Daniels-Florida)
W74-07294

SMALL BEACH EROSION CONTROL PROJECT, LEWES, DELAWARE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, Va. 22151, as EIS-DE-73-0493-F. March 1972. 11 p, 1 map.

Descriptors: *Delaware, *Erosion control, Reclamation, *Recreation facilities, Dredging, *Filling, Sedimentation, Planning, Land use, Estimating, Federal project policy, Environmental engineering, Environmental effects, Beach erosion, Fish conservation, Turbidity.
Identifiers: *Environmental impact statement, *Lewes(Del).

The feasibility was evaluated of restoring and stabilizing a portion of the shoreline of Lewes, Delaware, by providing beach erosion control measures resulting in a protective and recreational beach adequate to meet the area's present and future needs. The proposed plan consists of beach fill, periodic nourishment, sand fence and dune grass. The beach fill will be dredged from Roosevelt Inlet. Implementation of the plan would prevent storm damage, improve the beach's appearance, and satisfy recreational beach use demand. Disturbance of bottom sediments would cause a temporary increase in turbidity and bacterial counts in overlying waters which would not result in any significant effect on fishery resources, as the seasonal dredging would not interfere with shellfish or finish reproduction. Concurrence and approval of the plan by numerous federal and state agencies affirms the plan as an environmentally sufficient method of repairing the present beach erosion problem. (Silber-Florida)
W74-07295

A COMPUTER SIMULATION MODEL FOR FLOOD PLAIN DEVELOPMENT. PART II: MODEL DESCRIPTION AND APPLICATIONS,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6A.
W74-07296

NONLINEAR PROGRAMMING IN RIVER BASIN MODELING,
Calgary Univ. (Alberta). Faculty of Business.
For primary bibliographic entry see Field 5B.
W74-07298

FLOOD PROOFING DECISIONS WITH UNCERTAIN EVENTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6A.
W74-07299

SIMULATION--A TOOL FOR WATER RESOURCE MANAGEMENT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6A.
W74-07300

IPSWICH RIVER BASIN MODEL STUDY,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 6D.
W74-07302

ECONOMIC SIZE SELECTION FOR PVC PIPELINES,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8A.
W74-07303

A MODEL OF IRRIGATED AGRICULTURE AND REGIONAL DEVELOPMENT IN SOUTHERN ARGENTINA: THE RIO NEGRO BASIN,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 6A.
W74-07306

CAPITAL COST MINIMIZATION OF DRAINAGE NETWORKS,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
J. S. Dajani, and Y. Hasit.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 100, No. EE2, Proceedings paper No. 10448, p 325-337, April 1974. 3 fig, 2 tab, 18 ref.

Descriptors: *Drainage systems, *Networks, *Sewers, Costs, *Environmental engineering, Computers, Linear programming, Optimization, Model studies, Hydraulics, Sanitary engineering, Economics, Pipes, Flow design, Size, Systems analysis.
Identifiers: Separable-convex programming, Mixed-integer programming, *Cost minimization.

Three mathematical programming models for the optimization of drainage networks are presented and compared. The models suggest a feasible design methodology for selecting pipe size and slope combinations for a given network layout; the methodology produces the minimum cost design under given assumptions. The three models are based on two extensions of linear programming: separable-convex and mixed-integer programming. The former produces a continuous range of diameters while the latter limits the solution to discrete commercially available sizes. It is shown that while the former can be formulated with pipes flowing full, the latter must allow for partial flow. A solution which combines both these techniques is shown to produce a minimum cost system with partially-full flows and commercially available diameters. This solution requires less computer time than those based strictly on mixed-integer programming. An example seven-link drainage network has been designed by the three alternative model formulations and the results are presented. Mixed-integer programming coupled with convex-separable programming presents itself as a feasible design and optimization tool for drainage networks. (Bell-Cornell)
W74-07309

NETWORK APPROACH TO MANAGEMENT OF CONJUNCTIVELY OPERATED GROUND WATER - SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
A. S. Hamdan.
Available from the National Technical Information Service as PB-231 769 $13.00 in paper copy, $1.45 in microfiche. Ph.D Thesis, 1974 187p, 26 tab, 36 fig, 125 ref, 2 append. OWRR A-059-ILL(1) 14-31-0001-3813.

Descriptors: *Algorithms, *Illinois, Networks, *Conjunctive use, Water management(applied), Model studies, Costs, Water allocation, Planning, Forecasting, *Optimum development plans.
Identifiers: Management planning, *Network analysis, Optimum design, *Kaskaskia River Basin(Ill).

The approach involves modeling a problem as a network and solving it by network-based solution algorithms. The network model of a water resources system consists of nodes and directed arcs. The nodes represent supplies where water is originated, uses where water is consumed, and intermediate nodes where water is conserved. Linear unit 'costs' (representing actual costs or some function of returns) are imposed on appropriate network arcs. Any other constraints on the amount of water to be allocated from a particular supply to a particular use are also imposed as bounds on appropriate network arcs. A network model and the out-of-kilter Algorithm were used to determine optimal plans to meet the water supply requirements in the Kaskaskia River Basin in South-Central Illinois, over a planning period of 50 years starting in 1970, using local surface and ground water sources and a source of water import.
W74-07335

PLANAR AND AXISYMMETRIC BOTTOM WITHDRAWAL FROM A DENSITY-STRATIFIED RESERVOIR,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
J. C. Ho.
Available from the National Technical Information Service as PB-231 768 $15.50 in paper copy, $1.45 in microfiche. Ph.D. Thesis, 1973. 230 p, 48 fig, 3 tab, 42 ref, 8 append. OWRR B-080-WIS (1) 14-31-0001-3948.

Descriptors: Model studies, Engineering, Equations, *Resevoir releases, *Density currents, *Stratification, *Withdrawal, Flow, *Mathematical models, *Stratified flow.
Identifiers: Viscous flow, Transition flow, Sinks.

This study deals with theoretical and experimental investigations on selective withdrawal of a viscous, non-diffusive linearly stratified fluid from the bottom of a reservoir. Two-dimensional planar and axisymmetric flows are considered in the mathematical treatment. A model is developed to describe planar, bottom withdrawal. A solution to the governing differential equations is attempted using a momentum integral technique. Accordingly, the horizontal momentum equation is integrated across the withdrawal layer. Fourteen laboratory experiments were conducted on a tank 15 cm. wide, 60 cm. high and 600 cm. long to verify the mathematical model. A density-stratified fluid is produced by slowly releasing into the experimental reservoir, successive thin layers of salt solution of decreasing density. Horizontal velocity profiles are measured by photographing the displacement of an initially vertical dye streak. Experimental results confirm the predicted growth of the withdrawal layer and other theoretical findings, such as the maximum horizontal velocity in the withdrawl layer. An axisymmetric bottom withdrawal model is developed. The mathematical treatment is similar to that of the planar model. Twenty laboratory experiments were conducted on a tank in the shape of a quadrant 153 cm. in radius and 57 cm. high. Experimental data confirm the predicted growth of the withdrawal layer and other theoretical findings.
W74-07340

MANAGEMENT OF SOUTH WESTLAND TERRACE PODOCARP FOREST UNDER A SELECTION LOGGING SYSTEM,
New Zealand Forest Service, Harihari.
R. K. Gover.
N.Z.J. For. Vol 17, No 2, p 256-265, 1972. Illus.
Identifiers: Dacrydium-Cupressinum, Degradation, Forests, Logging, *Management, Mineral, *New Zealand(Westland), Nutrients, *Podocarp forests, Scarification, Soils, Terrace, Waterlogged.

Selection management began on the morainic podocarp forests of State tenure in south Westland(New Zealand) in 1963 in an effort to conserve forest structure and to provide a timber source in perpetuity. The area of these forests is 14,500 ha. During the first 7 yr of the initial cutting cycle (prescribed as 30 yr) some 710 ha were worked. Past clearfelling practices on these terraces caused severe soil degradation. The soils are naturally characterized by water logged mineral horizons, hardpan formations, lack of structure, severe leaching, acidity and extreme nutrient deficiency. Under the selection system, however, this degradation is kept to a minimum by retention of forest structure. Machines used, and extraction methods employed, are governed by stand condi-

tions. Mechanical damage to residual trees is kept to a minimum, rarely exceeding 5%, and machine scarification of the ground improves seedbed conditions. The effect heavy machinery is having on increment, through compaction of shallow feeding roots of rimu (Dacrydium cupressinum), is not certain at this stage. Ponding in localized areas also causes root damage to rimu, and subsequent mortality is rapid. Selection logging may eventually be extended to replace clearfelling practice in hill country forests. --Copyright 1973, Biological Abstracts, Inc.
W74-07347

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (TRINITY RIVER BASIN, TEXAS) REAL-TIME ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM,
Texas Univ., Austin. Center for Research in Water Resources.
Q. W. Martin, E. F. Gloyna, and W. G. Lesso.
Availability from the National Technical Information Service as PB-231 867, $6.00 in paper copy, $1.45 in microfiche. Completion Report CRWR-98, December 1973. 216 p, 31 fig, 22 tab, 75 ref. OWRR B-079-TEX (2). 14-01-0001-3337.

Descriptors: *Instrumentation, Data acquisition, On-site data collection, *Texas, Automatic control, Economic feasibility, Sampling, *Reservoir operation, River basins, Waste discharges, *River systems, Linear programming, Systems analysis, *Multiple purpose reservoirs, Management, Monitoring, Algorithm.
Identifiers: *Trinity River Basin(Tex), Dynamic systems operation, Water quality monitoring network.

The goal was to determine the conceptual requirements of future data acquisition and monitoring instrumentation systems for the efficient operation and management of a highly developed river basin system. The Trinity River Basin in Texas is selected as an example system for specific recommendations. The complexity of the entire Trinity River system is evaluated and the feasibility of using a real-time data acquisition system on the Trinity River and its tributaries is considered. The current state of the art in management instrumentation is evaluated to ascertain the extent of practical feasibility and applicability on both the micro- and macro-scale environments, i.e., the Dallas-Fort Worth area and the entire Trinity River Basin, respectively. An algorithm was developed for finding the optimal management policies for the dynamic operation of a system of multipurpose reservoirs, tertiary wastewater treatment plants, wastewater retention basins, and navigation locks and dams. This management procedure is designed to interface with a real-time water quality monitoring system so that operating policies can be adjusted to reflect changing environmental conditions.
W74-07369

SOLUTIONS FOR LATERAL OUTFLOW IN PERFORATED CONDUITS,
Ghent Rijksuniversiteit (Belgium). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W74-07433

DEVELOPMENT OF AN AGRICULTURAL DRAINAGE GUIDE,
Soil Conservation Service, Berkeley, Calif.
G. L. Dickey, and W. R. Johnston.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 1, p 97-99, January-February, 1973. 6 fig, 6 ref.

Descriptors: *Drainage, *Subsurface drainage, Tile drainage, Drainage systems, Drainage engineering, Drainage area, Drainage programs, *Design, *California.
Identifiers: *Drainage guide, Fresno County(Calif).

A simplified procedure for field investigation and design of subsurface drainage systems was developed for western Fresno County, California. Data were collected to a depth of 20 feet or more in deep soil in order to analyze the drainage problem. Standard soil surveys to the depth of 5 feet are of little value in determining drain depth requirements in deep soils; however, a correlation was found between 0 to 5-feet soil characteristics and the drainage coefficient. Existing drainage systems are needed for study and evaluation. This allows a drainage guide to be developed on actual drain performance. (Skogerboe-Colorado State)
W74-07438

SHALLOW DRAIN PERFORMANCE IN A HEAVY SOIL,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
L. F. Hermsmeier.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 1, p 92-94, January-February, 1973. 3 fig, 5 tab.

Descriptors: *Drainage, *Subsurface drainage, Tile drainage, Drainage systems, Drainage engineering, Drainage area, Drainage programs.

Shallow drains installed at a 4-foot depth and 200-foot spacing in a clay and loamy clay soil removed only from 12 percent to 7.2 percent of the salt added by the irrigation water during four cropping seasons over a 2-1/2 year period. The small amount of salt removed by the drains, when combined with salt removed from the soil by the natural drainage, was sufficient to maintain a favorable salt balance. However, during the sugarbeet cropping season when only 7.2 percent of the salt added by the irrigation water was removed by the drains there was an unfavorable salt balance in the field. Shallow drains can provide the means for removing sufficient salt from the soil to maintain a favorable salt balance when combined with natural drainage and good irrigation practice. (Skogerboe-Colorado State)
W74-07442

TRICKLE IRRIGATION IN AUSTRALIA,
For primary bibliographic entry see Field 3F.
W74-07450

IRRIGATION SURVEY.
For primary bibliographic entry see Field 3F.
W74-07451

A RAINFALL-RUNOFF MODEL BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07464

HERBIVOROUS FISH FOR AQUATIC PLANT CONTROL,
Waterways Experiment Station., Vicksburg, Miss.
E. O. Gangstad, J. J. Raynes, and R. M. Burress.
Available from the National Technical Information Service as AD-765 437; $4.75 in paper copy, $1.45 in microfiche. Aquatic Plant Control Program, Technical Report 4, June 1973. 150 p, 9 fig, 47 tab, 90 ref.

Descriptors: *Aquatic weed control, *Biocontrol, *Carp, *Herbivores, Aquatic plants, Arkansas, Florida, Georgia, Albama, California, Spawning, Stocking, Algae, Hatching, Fish genetics, Breeding, Fish, Fish reproduction, Fish harvest, Fish diets.
Identifiers: Israeli carp, White amur, Ctenopharyngodon idella, Hypophthalmichthys molitrix, Grass carp, Chinese carp, Indian carp, Catla catla, Labeo rohita, Cirrhina mrigala, Mylopharyngodon piceus, India.

Efficiency of white amur fish (Ctenopharyngodon idella) as a biological control agent of aquatic weed populations in natural habitats is determined and effects of space and plant nutrients resulting from destruction of weeds evaluated. Research was conducted in Arkansas, Florida, Georgia, Alabama, and California, and India. The artificial diploid gynogenesis method undoubtedly will be useful in selection of heterosis combinations. Such heterosis will evidently be possible in crossing of the 'topcross' type. In the preliminary study, spawning was successful during May after water temperatures reached 75F; little success was attained after water temperatures reached 87F. The white amur fish appears promising as an efficient agent for converting troublesome aquatic plant growth into a useful product, i.e., fish protein. Effects at various stocking rates on channel catfish and striped bass, and aquatic plants were determined. Benefits are shown of using white amur where biological methods of weed control are preferable to chemical methods. Apparently white amure do not pose a competitive threat for food organisms eaten by gamefish. Feasibility of successful hybridization of Chinese carp with Indian carp and vice versa indicates that hybrids of selected desirable qualities could probably be produced. The nutritional preferences are described. (Jones-Wisconsin)
W74-07470

RESPONSE OF AQUATIC WEEDS TO LASER RADIATION,
Athens Coll., Ala. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W74-07475

THE PAST AND PRESENT FLORA AND VEGETATION OF THE HACKENSACK MEADOWS,
For primary bibliographic entry see Field 2I.
W74-07476

POSSIBLE EFFECTS OF CONSTRUCTION AND OPERATION OF A SUPERTANKER TERMINAL ON THE MARINE ENVIRONMENT IN NEW YORK BIGHT,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W74-07488

SEEPAGE THROUGH A HILLSIDE: THE STEADY WATER TABLE,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 2G.
W74-07517

SALT DISPLACEMENT INTO DRAIN TILES UNDER PONDED LEACHING,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 2G.
W74-07518

SNOW ACCUMULATION AND SNOWMELT AS INFLUENCED BY A SMALL CLEARING IN A LODGEPOLE PINE FOREST,
Forest Service (USOA) Fort Collins, Colo. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2C.
W74-07526

POTENTIAL OF WESTLAND'S MORAINIC SOILS FOR FOREST MANAGEMENT,
New Zealand Forest Service, Hokitika.
R. J. Coker.

N Z J For. Vol 17, No 2, p 224-231, 1972. Illus.
Identifiers: Deposits, *Forest management, *Morainic soils, *New Zealand(Westland), Pleistocene, Podocarps, Soils.

More than 160,000 ha of lowland areas of the West Coast of the South Island of New Zealand consist of soils derived from outwash gravels or deposits of Pleistocene age. Over half this area is State forest land-much of it derelict following colonial-type exploitation of the high volume indigenous forests it once carried. Fires, excess surface water, lack of seed trees, and exposure have contributed to poor regeneration of podocarps, and to a large extent these areas are wastelands with no definite management policy. Management of the remaining well-forested terraces is being mastered by selection logging techniques which allow production without further contributing to management problems. An evaluation of species on the better sites in Mahinapua State Forest, which was planted with exotics during the late 1920s and early 1930s, indicates that these soils have potential for exotic production forest provided that only better sites are utilized and and a silvicultural regime is adopted which maximizes diameter growth.--Copyright 1973, Biological Abstracts, Inc.
W74-07594

THE AGE DYNAMICS AND THE ECONOMIC SELECTION CUTTINGS IN BROAD LEAVED DARK CONIFEROUS FORESTS OF THE WATER PROTECTIVE SHELTERBELT OF THE UFA RIVER WITHIN THE SVERDLOVSK REGION, (IN RUSSIAN),
E. P. Smolonogov.
Tr Inst Ekol Rast Zhivotn Ural Fil Akad Nauk SSSR. 77 p 117-134, 1970.
Identifiers: Age, *Coniferous forests, *Cuttings(Broad-leaf), *Economics, *Forests, Maturity, Mortality, Rivers, Shelterbelt, Stands, *USSR(Ufa River), Volume, Water.

In the shelterbelt of the Ufa River, USSR, there are about 6,500,000 m3 of mature and overmature wood. In 1953, regeneration cuttings were started in these forests. The change in the forest areas and in the mean stand volumes according to age classes for 1956-1966 s shown. Wood losses for that period amounted to 1,480,000 m3. On the basis of age structure dynamics, the standing volume and stand yield tables, a calculation was made of the magnitude of the natural mortality of the stands. Economic-selection cuttings are recommended, the intensity of which is based on the phases of quantitative maturity, natural maturity and renovation maturity of forests.--Copyright 1973, Biological Abstracts, Inc.
W74-07600

4B. Groundwater Management

GROUNDWATER GEOLOGY OF FORT VALLEY, COCONINO COUNTY, ARIZONA,
R. H. DeWitt.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1973 meetings of the Arizona Section-AWRA, and the Hydrology Section-Arizona Academy of Science, May 4-5, 1973, Tucson, Arizona, p 41-43, (1973). 1 fig, 2 ref.

Descriptors: *Perched water, *Clays, *Groundwater, *Geohydrologic units, *Fractures(Geologic), Geology, Sandstones, Sedimentary rocks, Faults, Alluvium, Igneous rocks, Conglomerate rocks, Aquifers, Water table, Infiltration, Runoff, Recharge, Watersheds(Basins), Surface drainage, Limestones, Reservoirs, *Arizona, Impervious soils, Water wells, Water yield.
Identifiers: Interflow.

All groundwater in Fort Valley is presently found in perched aquifers. The regional water table in the area is estimated to lie at a depth of approximately 1750 feet. Groundwater reservoirs are perched on impermeable clay zones located at the base of alluvial units. Groundwater is also found in highly fractured volcanic zones overlaying impermeable clay zones. Perched aquifers also occur in interflow zones above either impermeable clays or unfractured volcanics. Groundwater in Fort Valley is the result of infiltration or runoff and from precipitation. This recharge water infiltrates the alluvium or fractured volcanic rocks until an impermeable zone is reached where it becomes perched groundwater. Greatest well yields come from these recharge aquifers; their reliability is largely dependent on precipitation and runoff. Most wells in the Fort Valley area supply adequate amounts of water for domestic use. (Mastic-Arizona)
W74-07092

QUALITY OF WELL WATERS OF JAIPUR DISTRICT,
Udaipur Univ. (India).
K. V. Paliwal, and A. P. Gandhi.
Annals of Arid Zone, Vol 11, Nos 1 and 2, p 41-49, March and June 1972. 6 tab, 25 ref.

Descriptors: *Irrigation wells, *Dissolved solids, *Water quality, *Groundwater, *Salinity, Hardness(Water), Water analysis, Water chemistry, Water properties, Water resources, Saline water, Saline water systems, Salts, Sodium, Boron, Electrical conductance, Ions, Anions, Cations, Cation adsorption.
Identifiers: *India(Rajasthan).

Chaksu Panchayat Samiti of the Jaipur district of India is a dry region in need of groundwater for irrigation. This study examines this water in terms of water quality in an attempt to determine its suitability to that end. Ninety-two wells were analyzed for the pertinent ions in solution and for electrical conductivity. The waters were classified in terms of total dissolved solids, sodium absorption ratio, boron and bicarbonate content. Boron class and salinity-SAR groups are determined. The waters have a wide concentration rage but are, for the vast majority of the samples, extremely saline with a high SAR. Their indiscriminate use in agriculture is not indicated, although controlled and managed irrigation is possible. Cation/anion ratios should be used as indications of water quality in the evaluation of irrigation water. (Muller-Arizona)
W74-07106

WATER RESOURCES SEMINAR SERIES NO. 2.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W74-07133

APPLICATION OF GEOCHEMISTRY TO THE SEARCH FOR CRUDE OIL AND NATURAL GAS,
Research Council of Alberta, Edmonton.
B. Hitchon.
In: Introduction to Exploration Geochemistry, Applied Publishing Ltd, Calgary, Alberta, Canada, Chapter 13. p 509-545, 1974. 17 fig, 5 tab, 128 ref.

Descriptors: *Geochemistry, *Exploration, *Oil fields, *Oil, Investigations, Water chemistry, Water circulation, Groundwater movement, Surveys, Organic matter, Chemical analysis, Canada.

Geochemistry may be applied at several stages during the exploration of sedimentary basins for crude oil and natural gas. During the initial stages, when few wells have been drilled and no commercial accumulations discovered, proper application of modern geochemical techniques provides reliable information on the petroleum generating potential of the basin and allows selection of the major source rock groups. Once hydrocarbons have been discovered it is important to classify the crude oils and natural gases into geochemical families having distinctive sources, hydrologic histories and timing of generation, migration and accumulation. In this manner geochemically related hydrocarbons may be sought in unexplored areas and different stratigraphic units. In the final stage of exploratory sophistication computer modeling of all available geolocal, geophysical, geochemical and hydrologic data may be used to seek out commercial accumulations. Practical application of geochemistry to the search for crude oil and natural gas can only be accomplished by extensive multicomponent analysis of fluids and rocks, together with a knowledge of hydrodynamics and a thorough understanding of the basic geology of the sedimentary basin, coupled with computer modeling of the geological, geophysical, geochemical and hydrologic history of the basin. (Knapp-USGS)
W74-07161

PUBLIC GROUNDWATER SUPPLIES IN ADAMS COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
D. M. Woller.
Bulletin 60-1, 1973. 21 p.

Descriptors: *Groundwater, *Water wells, *Aquifer characteristics, *Illinois, Data collections, Hydrologic data, Hydrogeology.
Identifiers: *Adams County(Ill).

All available information on production wells used for public groundwater supplies in Adams County, Illinois, is presented. Systems and wells described furnish water for drinking or general domestic use in: (1) incorporated municipalities; (2) unincorporated communities where 10 or more separate lots or properties are being served or are intended to be served; (3) state-owned parks and memorials; and (4) state-owned educational, charitable, or penal institutions. Descriptions are included for groundwater supplies of 8 municipalities, 2 subdivisions, and 1 state park in Adams County. Consolidated bedrock aquifers, principally the Keokuk-Burlington limestone, are tapped as a primary source of both private and municipal supplies throughout much of the entire county. The estimated production of all municipal wells finished in limestone aquifers of the county was 250,000 gpd in 1970. Water from the limestone varies in iron content from 0.0 to 3.6 mg/liter and from 68 to 348 mg/liter in hardness. The towns of Golden and Liberty aerate to remove hydrogen sulfide; none of the towns removes iron or softens the water. (Knapp-USGS)
W74-07172

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
J. T. Johnson, and J. Thrailkill.
Journal of Hydrology, Vol 20, No 4, p 327-333, December 1973. 1 fig, 1 tab, 12 ref.

Descriptors: *Water wells, *Water yield, *Water quality, Hydrogeology, Karst hydrology, Statistical methods, Stratigraphy, Surface-groundwater relationships, Limestones, Water levels, *Kentucky, Topography, Structural geology.

Variables significantly affecting groundwater supply in the Centerville Quadrangle, Kentucky were those directly related to lithology (wellhead stratigraphy and well-bottom stratigraphy) and those interpreted as being strongly influenced by lithology (well depth, wellhead elevation, and well-bottom elevation). In addition, wells judged adequate for water supply were closer to surface streams and bottomed closer to stream level than dry holes. Adequate wells were also closer to synclinal axes than dry holes. There was no signifi-

cant difference between holes and adequate wells in their distance from sinkholes or regional structural position. Wells producing water with H2S differed from adequate wells only with regard to variables related to lithology. Saline-water wells were more abundant in areas distant from surface streams as well as in unfavorable lithology. The ten variables studied were examined using nonparametric statistical tests (the Mann-Whitney U and the Chi-square tests). (Knapp-USGS)
W74-07176

VERTICAL MOVEMENTS IN THE NONSATURATED ZONE AND THE SPECIFIC YIELD OF A WATER-TABLE AQUIFER (ETUDE DES TRANSFERTS VERTICAUX DANS LA ZONE NON SATUREE ET DE L'EMMAGASINEMENT D'UNE NAPPE LIBRE, DANS LE CAS D'UN POMPAGE, DANS LES CONDITIONS NATURELLES),
Bordeaux Univ. (France).
For primary bibliographic entry see Field 2F.
W74-07182

AQUIFERS IN THE SOKOTO BASIN, NORTHWESTERN NIGERIA, WITH A DESCRIPTION OF THE GENERAL HYDROGEOLOGY OF THE REGION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2F.
W74-07184

RECORDS OF GROUND-WATER LEVELS IN WYOMING, 1940-1971,
Geological Survey, Cheyenne, Wyo.
B. H. Ringen.
Wyoming State Water Planning Program Report No 13, 1973. 479 p, 25 fig, 2 ref.

Descriptors: *Hydrologic data, *Water wells, *Water levels, *Wyoming, *Data collections, Water level fluctuations.

The U.S. Geological Survey, in cooperation with city, state, and other Federal agencies, has measured the depth to water periodically in a large number of wells in Wyoming since 1940. This report publishes, in a single volume, groundwater-level measurements that have been made in Wyoming in the period 1940-71 by the U.S. Geological Survey. Water-level measurements by other agencies in several of the same wells measured by the U.S. Geological Survey have been included, where available, to provide greater detail in a record, or to increase the length of a record. Generally, water-level measurements are for wells with a sufficient number of measurements to show a trend of fluctuations. (Knapp-USGS)
W74-07186

LONG-TERM TRENDS IN GROUNDWATER LEVEL FLUCTUATIONS (MNOGOLETNIYE TENDENTSII V KOLEBANIYAKH UROVNEY POSZEMNYKH VOD),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2F.
W74-07191

ANNUAL REPORT/FISCAL YEAR 1973.
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 9D.
W74-07252

GROUND-WATER RESOURCES OF MCLEAN COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, N. Dak.
For primary bibliographic entry see Field 2F.
W74-07313

HYDROLOGIC CONDITIONS IN THE LAKELAND RIDGE AREA OF POLK COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla.
A. F. Robertson.
Florida Bureau of Geology Report of Investigation No 64, 1973. 54 p, 23 fig, 6 tab, 49 ref.

Descriptors: *Hydrogeology, *Florida, *Water levels, *Withdrawal, Water yield, Karst hydrology, Limestones, Water wells, Water quality, Saline water intrusion, Surface-groundwater relationships.
Identifiers: Lakeland(Fla).

In the Lakeland ridge area of Florida there has been an increase in groundwater pumpage from about 11 billion gallons in 1950 to 27 billion gallons in 1970. Decline in artesian water levels due to this pumpage is most pronounced in the southern part of the area of investigation where water levels have declined 50 feet or more in the last 20 years. The hazard of upward movement of water of poor quality is increased by the declines in freshwater level. Current water analyses reveal no widespread changes in quality of groundwater that can be correlated with water-level decline. The water levels of some lakes in the area were lower in June 1970 than in June 1961. A widespread zone of solution features in the limestone of the Floridan aquifer occurs at about 450 feet below mean sea level in the northeast part of the area of investigation and at about 650 feet below mean sea level in the south part of the area. Most wells open to this zone yield several thousand gpm with relatively small drawdowns. (Knapp-USGS)
W74-07318

DATA FOR MUNICIPAL WELLS IN THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. W. Page, L. R. Zeitz, and W. B. Kinsey.
Open-file report, January 3, 1974. 80 p, 2 fig, 5 tab.

Descriptors: *Data collections, *Hydrologic data, *Water wells, *California, Water yield, Drillers logs, Water levels.
Identifiers: Modesto(Calif).

Water for the city of Modesto, California, and the immediate area is supplied from 46 city wells, 49 wells owned by a private water company, and many privately owned domestic and industrial wells. Data are presented for the municipal wells. The city of Modesto incorporates about 12 square miles along and near the Tuolumne River in the northeastern part of the San Joaquin Valley, California. (Knapp-USGS)
W74-07320

HYDROLOGY OF THE DUNES AREA NORTH OF COOS BAY, OREGON,
Geological Survey, Portland, Oreg.
For primary bibliographic entry see Field 2L.
W74-07325

A COMPUTER SYSTEM FOR STORAGE AND RETRIEVAL OF HYDROGEOLOGICAL DATA FROM WELL RECORDS,
Natural Environment Research Council, London (England). Inst. of Geological Sciences.
For primary bibliographic entry see Field 7C.
W74-07328

NETWORK APPROACH TO MANAGEMENT OF CONJUNCTIVELY OPERATED GROUND WATER - SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07335

STRONTIUM AND OTHER NOTABLE CHEMICAL CONSTITUENTS OF WELL-WATER OF ALLEN COUNTY, INDIANA,
Geological Survey, Bloomington, Ind.
For primary bibliographic entry see Field 2K.
W74-07400

SANDSTONE AQUIFERS IN EASTERN SULLIVAN COUNTY, INDIANA,
Indiana Univ., Bloomington.
C. E. Wier, C. R. Glore, and A. F. Agnew.
Proceedings of the Indiana Academy of Science, Vol 82, p 297-302, 1972. 2 fig, 2 tab, 5 ref.

Descriptors: *Aquifer characteristics, Soil water, *Groundwater availability, Surface water, Watersheds(Basins), *Indiana, Geomorphology, *Wells, *Sandstones, *Subsurface waters, Water types, Water supply, Shales, Groundwater barriers, Bedrock, Groundwater movement, Hydrogeology, Aquifers, Permeability, Porosity, Domestic water.
Identifiers: Sullivan County(Ind), Busseron Creek(Sullivan County-Ind).

In the Busseron Creek watershed (Sullivan County, Indiana), surface waters are poor in both quality and quantity. Shallow wells in unconsolidated deposits and in Pennsylvania sandstones supply most of the rural domestic water needs, but most wells produce less than 10 gal/min. At least 6 potential sandstone aquifers of Pennsylvania age exist at depths ranging from 10 to 600 ft in thicknesses ranging from 1 to 104 ft. Although these sandstone bodies are considered as sheet sands, they are lenticular and mostly confined by shale above and below. Hence recharge of these aquifers is minimal, except where the sandstone body intersects the bedrock surface and is recharged by groundwater moving downward through the unconsolidated deposits. These sandstones are finely grained and well cemented. Their porosity ranges from 11 to 50%, calculated from electrical logs of oil and gas test holes. Their permeability coefficient is very low, ca. 0.04 gal/day/sq ft. Recorded well water production from sandstone averages less than 4 gal/min. Thus, the sandstones are poor aquifers and cannot furnish sufficient water for a small municipality, but may be used successfully by individual households. Deeper sandstones should be investigated. (Brown-IPC)
W74-07401

THE GEOLOGY OF WATER: THE LIMITING FACTOR IN URBAN DEVELOPMENT,
Indiana Purdue Univ., Indianapolis. Dept. of Geology.
For primary bibliographic entry see Field 3D.
W74-07402

PUBLIC GROUNDWATER SUPPLIES IN BOND COUNTY,
Illinois State Water Survey, Urbana. Hydrology Section.
D. M. Woller.
Bulletin 60-3, 1973. 9 p.

Descriptors: *Groundwater, *Water wells, *Aquifer characteristics, *Illinois, Data collections, Hydrologic data, Hydrogeology, *Water supply, Potable water.
Identifiers: Bond County(Ill).

All available information on production wells used for public groundwater supplies in Bond County, Illinois, is presented. Systems and wells described furnish water for drinking or general domestic use in: (1) incorporated municipalities; (2) unincorporated communities where 10 or more separate lots or properties are being served or are intended to be served; (3) state-owned parks and memorials; and (4) state owned educational, charitable, or penal institutions. Descriptions are included for groundwater supplies of 3 municipalities in Bond

County. These are preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for municipal use. Unconsolidated sand and gravel deposits associated with the valleys of the East Branch of Shoal Creek and Beaver Creek are tapped as the sources for the three municipal supplies in Bond County. At Greenville, Mulberry Grove, and Pocahontas, there are presently 9 municipal wells tapping these aquifers to depths ranging from 31 to 74 ft. Their reported yields range from 12 to 250 gpm depending primarily upon the type of well and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each well. Production from these wells was estimated to be 335,000 gpd in 1972. Analyses of water they produce indicate that the iron content ranges widely (from 0.0 to 36 mg/liter) and the hardness from 80 to 508 mg/liter. Groundwater for all the municipal supplies is chlorinated and fluoridated. In addition, water for Mulberry Grove and Pocahontas is aerated, settled, and filtered for iron removal, and at Pocahontas the pH is adjusted. (Knapp-USGS)
W74-07429

UNDERFLOW IN RIVER VALLEYS OF THE CARPATHO-UKRAINE (PODRUSLOVYY STOK V RECHNYKH DOLINAKH ZAKARPAT'YA),
Akademiya Nauk USSR, Kiev. Instytut Geologichnykh Nauk.
For primary bibliographic entry see Field 2F.
W74-07504

BROMINE IN GROUNDWATER OF UZBEKISTAN (BROM V PODZEMNYKH VODAKH UZBEKISTANA),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 2K.
W74-07505

GROUND-WATER FLOW PATTERNS IN CONFINED AQUIFERS AND POLLUTION,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 5B.
W74-07510

EFFECT OF PARTIAL PENETRATION ON FLOW IN UNCONFINED AQUIFERS CONSIDERING DELAYED GRAVITY RESPONSE,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2F.
W74-07514

STEADY STATE FLOW IN RIGID NETWORKS OF FRACTURES,
Leeds, Hill and Jewett, Inc., San Francisco, Calif.
For primary bibliographic entry see Field 2F.
W74-07521

4C. Effects On Water Of Man'S Non-Water Activities

EFFECTS OF MAN-MADE WORKS ON THE HYDRAULIC, SALINITY, AND SHOALING REGIMENS OF ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div.
For primary bibliographic entry see Field 5C.
W74-07249

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07323

SEDIMENT DISCHARGE IN THE LAKE TAHOE BASIN, CALIFORNIA, 1972 WATER YEAR,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W74-07326

WATER POLLUTION ASPECTS OF STREET SURFACE CONTAMINANTS,
URS Research Co., San Mateo, Calif. Environmental Systems Div.
For primary bibliographic entry see Field 5B.
W74-07418

COMPARISON OF RAINFALL-RUNOFF MODELS FOR URBAN AREAS,
India Inst. of Tech., Kanpur.
For primary bibliographic entry see Field 2A.
W74-07463

RELATIONSHIP BETWEEN LOGGING ACTIVITIES AND SALMON PRODUCTION,
Alaska Dept. of Fish and Game, Juneau.
A. P. Kingsbury.
Available from the National Technical Information Service as COM-73-11630; $5.00 in paper copy, $1.45 microfiche. National Marine Fisheries Service Report No. NOAA 73090605, April 1973. 59 p, 13 fig, 1 tab, 33 ref, 10 append. 5-24-R.

Descriptors: *Sedimentation, *Lumbering, *Salmon, *Productivity, Bottom sediments, Pink salmon, Fry, Streams, *Alaska, Spawning, Dissolved oxygen, Seasonal, Gravels, Fish eggs, Road construction, Streamflow.

Effects of logging and road building on stream flow, water temperature and debris on salmon egg and fry production were assessed quantitatively and additional data obtained on sediment content of spawning gravel, intra-gravel, dissolved oxygen and salmon abundance. Studies were conducted at 108 Creek and Kadashan Creek in southeastern Alaska. Spawning bed sediment and dissolved oxygen and pink salmon survival data were assembled and are discussed in relation to logging and road building. Fine sediment in three 108 Creek study areas increased somewhat irregularly over the first six years of the study and did not change appreciably in the following three years. Analysis of the relationship between amount of fine sediment and dissolved oxygen content within the gravel in the streams was inconclusive. Decreases in fine sediments were usually associated with high stream flow and high spawner density. Estimates of overwinter survival of pink salmon were too imprecise and are affected by too many factors for use as a measure of land use effectson pink salmon production. Intra-gravel sediment and dissolved oxygen data were highly variable within and between Kadashan Creek study areas. Effects of logging and roading on the pink salmon production were difficult to demonstrate. (Jones-Wisconsin)
W74-07468

EFFECT OF GRAZING ON RUNOFF FROM TWO SMALL WATERSHEDS IN SOUTHWESTERN WISCONSIN,
Forest Service (USDA), La Crosse, Wis. Watershed Lab.
R. S. Sartz, and D. N. Tolsted.
Water Resources Research, Vol 10, No 2, p 354-356, April 1974. 3 fig, 2 tab, 1 ref.

Descriptors: *Rainfall-runoff relationships, *Grazing, *Water yield, Land use, *Small watersheds, Hydrograph analysis, *Wisconsin.

Storm runoff from two small open pasture watersheds was measured for 11 years; during the first 7 years both were grazed, and during the last 4 years only one was grazed. Their runoff behavior was similar when both were grazed, but by the third year after cessation of grazing, runoff from the ungrazed watershed had dropped sharply. The ungrazed/grazed ratio for mean total flow had dropped from 1.17 to 0.10 and for mean peak flow from 0.82 to 0.03. After 3 years without grazing a heavy mat of bluegrass blanketed the ground, and soil bulk density was significantly lower. (Knapp-USGS)
W74-07525

4D. Watershed Protection

REACTIVATING SOIL RIPPING TREATMENTS FOR RUNOFF AND EROSION CONTROL IN THE SOUTHWESTERN U.S.,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W74-07089

SAND DUNE RECLAMATION IN IRAQ -- PRESENT STATUS AND FUTURE PROSPECTS,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2J.
W74-07104

CONTROL OF GRADING PRACTICES IN THE CITY AND COUNTY OF HONOLULU,
Honolulu City and County Dept. of Public Works, Hawaii.
R. Chun.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 85-88,

Descriptors: *Erosion control, *Grading, *Legislation, *Hawaii, Control, Rockslides, Landslides.
Identifiers: *Honolulu(Hawaii).

Early grading operations ordinances in the City and County of Honolulu may have been the result of early subdivision planning which had little or no concern for potential landslides which might result, and which lead to events threatening the safety of human lives and caused severe property damages. The existing ordinance presently controlling grading activities was passed in 1955. Its primary feature was the adding of control over grubbing and stockpiling operations. Most recent changes in regulations are concerned with broader environmental concerns, including drainage and erosion control plans, sediment control, and broader planning requirements which provide for explicit consideration of alternative plans that would minimize grading. (See also W74-07133) (Schroeder-Wisconsin)
W74-07139

QUALITY OF WATER DISCHARGED FROM TWO AGRICULTURAL WATERSHEDS IN SOUTHWESTERN IOWA,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
For primary bibliographic entry see Field 5B.
W74-07528

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

VARIABLES AFFECTING WELL SUCCESS IN A KENTUCKY LIMESTONE AQUIFER,
Kentucky Univ., Lexington. Dept. of Geology.
For primary bibliographic entry see Field 4B.
W74-07176

AQUIFERS IN THE SOKOTO BASIN, NORTHWESTERN NIGERIA, WITH A DESCRIPTION OF THE GENERAL HYDROGEOLOGY OF THE REGION,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 2F.
W74-07184

TECHNIQUES FOR USE OF ORGANIC AND AMORPHOUS MATERIALS IN SOURCE INVESTIGATIONS OF ESTUARY SEDIMENTS,
For primary bibliographic entry see Field 2L.
W74-07241

TEXTURE AND ORGANIC CARBON CONTENT OF BOTTOM SEDIMENTS IN SOME ESTUARIES OF THE UNITED STATES,
Middlebury Coll., Vt.
For primary bibliographic entry see Field 2L.
W74-07243

PHOTOMETRIC DETERMINATION OF MANGANESE IN WATER BY USING O-TOLIDINE,
Water Management Board, Brno (Czechoslovakia).
For primary bibliographic entry see Field 2K.
W74-07315

DETERMINATION OF CHLORINATED INSECTICIDES IN SUSPENDED SEDIMENT AND BOTTOM MATERIAL,
Geological Survey, Menlo Park, Calif.
D. F. Goerlitz, and L. M. Law.
Journal of the Association of Official Analytical Chemists, Vol 57, No 1, p 176-181, 1974. 1 fig, 2 tab, 21 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Bottom sediments, *Suspended load, *Chromatography, *Insecticides, Adsorption, Sorption, Analytical techniques, *Pollutant identification.

Chlorinated hydrocarbon insecticides in suspended sediment and bottom material were extracted with acetone-hexane solvent, with the extractants added separately. Co-extractives, including polychlorinated biphenyls and polychlorinated naphthalenes, were isolated by adsorption chromatography. Sulfur is removed by precipitation. Mean recoveries from 8 spiked samples ranged from 75% to 99% for 9 chlorinated hydrocarbon insecticides. An average recovery of 97.9% was obtained for bottom material samples contaminated with chlorinated hydrocarbons. (Knapp-USGS)
W74-07317

TH-234/U-238 ACTIVITY RATIOS IN PACIFIC OCEAN BOTTOM WATERS,
Tata Inst. of Fundamental Research, Bombay (India).
For primary bibliographic entry see Field 2K.
W74-07322

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07323

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUB-OPTIMIM WEATHER,
Earth Satellite Corp., Washington, D.C.
R. I. Welch, A. D. Marmelstein, and P. M. Maughan.
Copy Available from GPO Sup Doc as EP1.23/2:73-243, $1.40; microfiche from NTIS as PB-231 817 $1.45. Environmental Protection Agency, Technology Series EPA-R2-73-243, September 1973. 55 p, 6 fig, 3 tab, 1 ref. EPA Contract 68-01-0191.

Descriptors: Water pollution sources, *Oil spills, Chemicals, *Remote sensing, *Aerial photography, Cloud cover, *Pollutant identification, Weather data.
Identifiers: *Sub-optimum weather, Hazardous materials.

Multi-band aerial photography was acquired during specified conditions of cloud cover and reduced visibility considered to be representative of a nearly infinite range of sub-optimum weather conditions. (For aerial photography, optimum is defined as clear skies and greater than 15 miles visibility.) Basic techniques were derived from an earlier study designed to yield strategic spill prevention surveillance. (Welch, et al. 1972) Results indicated that only one film tested, a high sensitivity color positive film, provided consistently interpretable results. Rapid access techniques were also evaluated leading to recommendations for a tactical system providing a capability for both real-time and near real-time system update during sub-optimum aerial photographic conditions. (EPA)
W74-07342

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (TRINITY RIVER BASIN, TEXAS) REAL-TIME ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-07369

MICROBIAL INDICATORS FOR THE BIOLOGICAL QUALITY OF TREATED WASTEWATER EFFLUENTS,
Dept. of Civil Engineering. Illinois Univ., Urbana.
For primary bibliographic entry see Field 5D.
W74-07372

USE OF AMBERLITE XAD-4 FOR EXTRACTION AND RECOVERY OF CHLORINATED INSECTICIDES AND POLYCHLORINATED BIPHENYLS FROM WATER,
Bristol Univ. (England). Dept. of Inorganic Chemistry.
For primary bibliographic entry see Field 5D.
W74-07383

DETERMINATION OF PENTACHLOROPHENOL IN NATURAL AND WASTE WATERS,
Canada Centre for Inland Waters, Burlington (Ontario).
A. S. Y. Chau, and J. A. Coburn.
Journal of the Association of Official Analytical Chemists, Vol 57, No 2, p 389-393, March 1974. 5 fig, 3 tab, 11 ref.

Descriptors: *Pulp wastes, *Industrial wastes, Sewage, *Water analysis, *Chlorinated hydrocarbon pesticides, *Phenols, *Pollutant identification, Waste water(Pollution), Chemical analysis, Analytical techniques, Chromatography, Gas chromatography, Water types.
Identifiers: Pentachlorophenol, Chlorine compounds.

In a sensitive and reliable procedure for the routine determination of pentachlorophenol (PCP) in waters, the PCP is extracted from the preserved sample with benzene and thence into a potassium carbonate solution. The addition of acetic anhydride to the aqueous solution produces PCP acetate which is extracted with hexane and analyzed by electron capture gas-liquid chromatography. Typical PCP concentrations determined in lake waters, sewage, and a pulp mill effluent are presented, along with the retention times of 17 other phenolic acetates. The new procedure can detect concentrations of PCP as low as 0.01 ppb per liter of water. (Brown-IPC)
W74-07385

STRONTIUM AND OTHER NOTABLE CHEMICAL CONSTITUENTS OF WELL-WATER OF ALLEN COUNTY, INDIANA,
Geological Survey, Bloomington, Ind.
For primary bibliographic entry see Field 2K.
W74-07400

QUANTITATIVE CHEMICAL ANALYSIS OF SPECIFIC COMPONENTS OF THE WATERS OF LOST CREEK AND THE WABASH RIVER, VIGO COUNTY, INDIANA,
Indiana State Univ., Terre Haute. Dept. of Chemistry.
D. G. Lesniak, M. C. Tavenner, and J. R. Siefker.
Proceedings of the Indiana Academy of Science, Vol 82, p 176-179, 1972. 1 tab, 4 ref.

Descriptors: *Water analysis, Rivers, *Indiana, Surface waters, Water temperature, Conductivity, Iron, Lead, Sodium, Zinc, Dissolved oxygen, Chlorides, Fluorides, Hydrogen ion concentration, *Pollutant identification, *Dissolved solids.
Identifiers: *Wabash River(Ind), *Lost Creek(Ind), Vigo County(Ind).

The surface waters of Lost Creek and the Wabash River were sampled February-May 1972 at several sites in Vigo County, Indiana. Dissolved and total concentrations of Fe, Pb, Na, and Zn were measured. The river stage, water temperature, specific conductance, pH, and concentrations of chloride and fluoride ions and dissolved oxygen were also determined. Fluoride, Fe, Pb, and Zn concentrations were higher in the Wabash River than in Lost Creek, whereas the pH and Na concentration were higher in Lost Creek than in the Wabash River. (Brown-IPC)
W74-07405

DETERMINATION OF NITRATES IN SOIL EXTRACTS,
British Columbia Univ., Vancouver. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-07443

THE ENVIRONMENTAL IMPACT OF CADMIUM,
Connecticut Univ., Storrs.
L. Bruckman.
Msc Thesis, 1974. 102 p, 12 fig, 22 tab, 116 ref, 3 append.

Descriptors: *Cadmium, *Water quality standards, *Water pollution sources, *Environmental effects, Trace elements, Sewage treatment, Sulfides, Heavy metals, *Connecticut, Potable water, Public health, Monitoring, Toxicity.
Identifiers: Health, Drinking water standards, Cadmium-Organic complexes, Storrs(Conn).

The sewage treatment plant and household drinking water supplies in the Storrs, Connecticut area have been monitored for the cadmium content. Cadmium was not present in concentrations above the drinking water standard of 10 mg/l and therefore, does not appear to pose a serious water pollution problem at this time in these places. Tenfold concentrations by evaporation were used for analyses by an Atomic Absorption Spectrophotometer in order to be well above sensitivity limits. Controls, cadmium spiked in the waters and sewage gave 90% plus recoveries by this technique. In addition to the possibility that cadmium may not be present in water supplies to begin with, the absence of cadmium could be due to the presence of trace amounts, less than 1 mg/l, of sulfides and the formation and precipitation of extremely insoluble complex-breaking sulfide compounds. It is recommended that ferrous sulfide be considered for addition to conventional sewage treatment so as to make sulfide ions readily available to react with certain heavy metals present, like cadmium, thus removing them from waters. A literature review is presented on the health effects of trace amounts of cadmium present in the environment and bases for toxicity criteria on cadmium are quantitatively presented. (Helfgott-Connecticut)
W74-07530

THE MARINE DIATOM ETHMODISCUS REX: ITS MORPHOLOGY AND OCCURRENCE IN THE PLANKTON OF THE SARGASSO SEA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
E. Swift.
Journal of Phycology, Vol 9, No 4, p 456-460, December 1973. 12 fig, 1 tab, 13 ref.

Descriptors: *Diatoms, *Marine algae, *Plant morphology, *Cytological studies, Chrysophyta, Phytoplankton, Electron microscopy, Hydrography, Speciation.
Identifiers: *Ethmodiscus rex, *Scanning electron microscopy, *Sargasso Sea, Sample preparation.

Living cells of the diatom Ethmodiscus rex (Rattray) Wiseman and Hendey 1953 were found in the plankton of the sourthern Sargasso Sea. Apparently, this is the first report of E. rex from the plankton of the Atlantic Ocean. Scanning electron microscopy of peroxide-cleaned frustules revealed some new morphological features for this species. When viewed from inside the frustule, the puncta appear as rimmed pits. From outside the frustule, they appear to be shallow depressions with a small opening at the bottom. The so-called mucous tubules in the center of the valve were seen from the outside to be elongate slits and from the inside as obliquely directed flattened cylinders which cap the tubes. (Holoman-Battelle)
W74-07547

THE CHEMICAL FORM AND BODILY DISTRIBUTION OF MERCURY IN MARINE FISH,
Tohoku Univ., Sendai(Japan). Dept. of Public Health.
T. Suzuki, T. Miyama, and C. Toyama.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 6, p 347-355, December 1973. 2 fig, 3 tab, 14 ref.

Descriptors: *Mercury, *Marine fish, *Pollutant identification, *Distribution patterns, Chemical analysis, Inorganic compounds, Heavy metals.
Identifiers: *Animal tissues, *Cold atomic absorption spectrophotometry, *Bioaccumulation, Muscle, Liver, Brain, Brain, Kidneys, Gastric contents, Organic mercury.

One gram of muscle, liver, brain, kidney, and gastric content of fish, or about half of the organ weighing less than 2 g was homogenized in a phosphate-buffer solution (pH 8.6, 1/16 M), and analyzed for inorganic mercury by cold vapor atomic absorption photometry. Weight of fish and the level of total mercury are independent of the inorganic mercury percentage. Comparing the values in the muscle, both inorganic mercury percentages and levels of total mercury are elevated in the liver and kidney. The total mercury content in the liver, excluding the data on fish from the Japan Sea, is also significantly correlated with body weight but this is not seen in the case of the kidney. The data on the brain are difficult to interpret both regarding the level of total mercury and the inorganic mercury percentage. The level of total mercury of the gastric content is markedly higher in greenlings from the Japan Sea than in other fishes from the South China Sea, which means a difference in the mercury level in the habitat, and may contribute to the differing relationships between body weight and the total mercury level in the muscle and liver. The pattern of bodily distribution changes depending on the chemical form of mercury. In the case of inorganic mercury, three significant correlation coefficients are found, that is, 'kidney' vs 'muscle' and 'liver', and 'liver' vs 'brain'. There is a different pattern for organic mercury. The distribution pattern of total mercury is similar to that of organic mercury. (Holoman-Battelle)
W74-07551

THE PHOTOCHEMISTRY OF CARBAMATES. 1. THE PHOTODECOMPOSITION OF ZECTRAN: 4-DIMETHYLAMINO-3,5-XYLYL-N-METHYL CARBAMATE,
New Brunswick Univ., Fredericton. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-07552

ROTATING RING-DISK ELECTRODE STUDY OF THE ADSORPTION OF LEAD ON GOLD IN 0.5M POTASSIUM CHLORIDE,
State Univ. of New York, Buffalo. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-07555

MASS AND CHARGE TRANSFER KINETICS AND COULOMETRIC CURRENT EFFICIENCIES. PART VII. CONDITIONAL POTENTIALS, AND SINGLE-SCAN VOLTAMMETRY OF PURE VANADIUM(V) - VANADIUM(IV) SYSTEMS IN VARIOUS MEDIA AT PLATINUM ELEC TRODES PRE-TREATED BY FIVE METHODS,
Exeter Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-07557

MASS AND CHARGE TRANSFER KINETICS AND COULOMETRIC CURRENT EFFICIENCIES. PART VIII. SINGLE-SCAN VOLTAMMETRY OF VANADIUM(V) - VANADIUM(IV) IN THE PRESENCE OF CHROMIUM, MANGANESE AND IRON, AND THE KINETIC PARAMETERS OF THE VANADIUM SYSTEM, AT PLATINUM ELECTRODES PRE-TREATED BY FIVE METHODS,
Exeter Univ. (England). Dept. of Chemistry.
E. Bishop, and P. H. Hitchcock.
Analyst, Vol 98, No 1169, p 563-571, August 1973. 6 fig, 1 tab, 7 ref.

Descriptors: *Kinetics, Heavy metals, Cations, Electolytes, Electrochemistry, Chromium, Manganese, Iron, Electric currents, Efficiencies, Zeta potential.
Identifiers: *Platinum electrodes, *Single scan voltammetry, *Charge transfer, *Mass transfer, *Vanadium, Ionic interference, Pretreatment methods, Coulometric currents, Electrochemical reactions.

Continuing the earlier examination of the vanadium system alone, under various conditions and with various electrode pre-treatments, the effect of neighboring steel-forming d-block elements has been investigated. Chromium(VI) at pH 4.0 suppresses the vanadium(V) reduction wave, and the degree of suppression is quantitatively proportional to the chromium(VI) concentration. Activated electrodes are deactivated by dipping them in a chromium(VI) solution, and remain so even when well washed thereafter, so that chromium(VI) as well as chromium(III) is absorbed strongly on platinum. In 2.0 M sulphuric acid, chromium(VI) and vanadium(V) are reduced at the same rate. Manganese(VII) in acetate buffer gives a fast, well separated wave, but the separation is not as good in 2.0 M sulphuric acid; slowing the vanadium(V) reduction by using an oxidized electrode effects no improvement: the manganese wave is similarly affected. Addition of chromium(VI) to the manganese - vanadium mixture at pH 4 suppresses the manganese wave only slightly, even when the vanadium wave is completely suppressed. In 2.0 M sulphuric acid, the manganese wave is undistorted and chromium and vanadium are simultaneously reduced. Iron(III) in 2.0 M sulphuric acid does not interfere, but the separation of the vanadium and iron waves is not good. Iron(II) can, however, act as a potentiostatic intermediate. The kinetic parameters of the vanadium system are reproducible in acetate buffer, but only when the electrode is fouled in 2.0 M sulphuric acid. Pattern theory and diffusion-corrected Lewartowicz methods give results that agree. The charge-transfer kinetic parameters are shown to be potential dependent in acidic media. The results are compared with those in earlier reports. The generation current efficiency for vanadium(IV) in acetate buffer was computed. (See also W74-07557) (Holoman-Battelle)
W74-07558

A NEW COLORIMETRIC PROCEDURE FOR THE DETERMINATION OF BENOMYL,
Norges Landbrukshoegskole, Vollebekk. Chemical Research Lab.
J. Kvalvag.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 3, p 137-139, September 1973. 1 tab, 4 ref.

Descriptors: *Colorimetry, *Pollutant identification, Fungicides, Aqueous solutions, Hydrolysis, Separation techniques, Fruit crops, Vegetable crops, Pesticide residues.
Identifiers: *Benomyl, Metabolites, 2-Aminobenzimidazole, Cleanup, Sodium hypochlorite, Sample preparation.

A colorimetric procedure for the combined determination of the fungicide benomyl and metabolites hydrolyzable to 2-aminobenzimidazole is described. The prodcedure is based on the intense blue color that appears when hypochlorite or hypobromite is added to an aqueous solution of 2-aminobenzimidazole. An extraction, hydrolysis, and cleanup prodecure described elsewhere is used. The final evaporation is halted when sufficient ethyl acetate has evaporated to leave an essentially aqueous solution. This solution is poured into a 10 ml centrifuge tube, the beaker is washed with 3 ml hot water, and this is added to the solution in the tube. After cooling, the volume is adjusted to 5 ml and part of the contents is transferred to an optical cell. Measurement is made at 560 nm against water, and the sample discarded if absorbance is higher than 0.015. Two drops of sodium hypochlorite are added to an acceptable solution, and the cell is placed quickly in the colorimeter compartment. The absorbance is compared with a standard curve. If the uncertainty span is confined to three times the absorbance mentioned above, the limit of detection is slightly above 2 micrograms/ml 2-aminobenzimidazole which corresponds to 0.5 ppm benomyl in a 50-g sample based on a 5 ml final volume. In order to check precision of the method four different crops were fortified with 2 ppm of benomyl and analyzed. (Mortland-Battelle)
W74-07559

MULTIPLE ORGANOCHLORINE PESTICIDE RESIDUES IN JAPAN,
Kitakyushu Municipal Inst. of Public Health (Japan).
M. Suzuki, Y. Yamato, and T. Watanabe.
Bulletin of Environmental Contamination and Toxicology, Vol 10, No 3, p 145-150, September 1973. 3 fig, 3 tab, 14 ref.

Descriptors: *Pesticide residues, *Soils, *Gas chromatography, Aldrin, Dieldrin, Endrin, DDE, DDT, Vegetable crops, Soil analysis, DDD.
Identifiers: BHC, *Japan(Kyushu district), Sample preservation, Sample preparation, Isomers.

Organochlorine pesticide residues were analyzed in agricultural soil of the Kyushu district in Japan. Soil samples were taken 15 cm deep, stored at -30C, then air dried, pulverized, screened in a 20-mesh sieve, and mixed. For analysis, one hundred grams of dry soil was mixed with a 0.70 volume of water in a high speed mixer and deactivated for 30 min. After this treatment, 200 ml of acetonitrile was added and blended at a high speed for 5 min. An extract was filtered, and the filtrate was poured into a 1 liter separatory funnel, shaken with 100 ml of n-hexane for 5 min., and partitioned with 600 ml distilled water by shaking for 1 min. Then the n-hexane layer was washed twice with 100 ml distilled water. The n-hexane layer was dried. The column was rinsed twice with approximately 5 ml of n-hexane, and washings were mixed into the layer. The dried n-hexane solution was applied to a gas chromatograph equipped with a tritium foil electron capture detector. Gas chromatographic determination was carried out by combining three different columns. The typical multiple organochlorine pesticide residues in soil are given. Alpha-, beta-, gamma-, and delta-BHC were detected in all 99 soil samples. Considerable residual amounts of aldrin, dieldrin and endrin and high residual levels of DDT and its related compounds were detected. (Mortland-Battelle)
W74-07560

INCIDENCE OF RESISTANCE TO TETRACYCLINE, CHLORAMPHENICOL AND AMPICILLIN AMONG SALMONELLA SPECIES ISOLATED IN THE NETHERLANDS IN 1969, 1970 AND 1971,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands).
For primary bibliographic entry see Field 5C.
W74-07562

PSYCHROPHILIC YEASTS ISOLATED FROM MARINE FISH,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology.
J. Bruce, and E. O. Morris.
Antonie van Leeuwenhoek, Vol 39, No 2, p 331-339, 1973. 1 tab, 32 ref.

Descriptors: *Yeasts, *Marine fish, *Pathogenic fungi, *Isolation, Nutrient requirements, Fish, Hosts, Temperature, Vitamins, Speciation, Cultures, Methodology, Herrings.
Identifiers: *Psychrophilic fungi, Culture media, Deuteromycetes, Candida scotti, Debaryomyces hansenii, Candida tropicalis var. lambica, Cryptococcus diffluens, Cryptococcus laurentii, Torulopsis famata, Torulopsis sake, Trichosporon pullulans, Rhodotorula glutinis, Rhodotorula mucilaginosa, Rhodotorula infirmo-miniata, Whiting, Skate, Haddock, Halibut, Flounder, Lemon sole.

Yeasts were isolated from marine fish using low incubation temperatures. The isolates were screened for their ability to grow at 4 C and 30 C. Isolates growing at 4 C but not at 30 C were considered to be psychrophilic and were selected for further study. Approximately 25 percent of the isolates were in this category. The isolates comprised the following genera: Candida, Cryptococcus, Debaryomyces, Rhodotorula, Torulopsis and Trichosporon. Rhodotorula infirmo-miniata accounted for 50 percent of the isolates and Trichosporon pullulans 10 percent. Other species were present in numbers below the 10 percent level. The distribution of the species between the two sample areas is discussed. The vitamin requirements and optimum growth temperatures of the isolates were assessed. (Holoman-Battelle)
W74-07563

SOLVENT EXTRACTION OF SULFUR FROM MARINE SEDIMENT AND ITS DETERMINATION BY GAS CHROMATOGRAPHY.
University of Southern California, Los Angeles, Environmental Engineering Program.
K. Y. Chen, M. Moussavi, and A. Sycip.
Environmental Science and Technology, Vol 7, No 10, p 948-951, October 1973. 4 fig, 2 tab, 14 ref.

Descriptors: *Sulfur, *Solvent ex.ractions, *Separation techniques, *Sediments, *Gas chromatography, Colorimetry, Soil analysis, Pollutant identification,
Identifiers: Comparative techniques, Sample preservation, Sample preparation, Detection limits.

The feasibility of elemental sulfur extraction and analytical determination by gas chromatography (gc) is examined. To get maximum response from the gc, various experiments were performed using different parameter settings. The operating conditions at which optimum responses for sulfur were obtained were: injection port temperature - 220 C, oven column temperature - 190 C, EC detector temperature - 265 C, and gas flow - 84-90 ml/min. At these settings, after injection of standards or extracts, the predominant sulfur species eluted were S4, S6, and S8. The S8 species exhibits the largest area and peak height. The recovery of sulfur from sediment was carried out initially with a sediment sample of unknown sulfur content. The purpose was to evaluate the efficiency of different solvents in recovering sulfur and to evaluate their suitability for subsequent determinations by both colorimetry and chromatography. Only benzene and toluene exhibited high recovery efficiencies and showed consistent results in both methods. The detection limit of the method described was at the picogram level, unmatched by other known methods. Neither the coefficient of variation nor mean values for sulfur were significantly different in comparisons between the gc method and a standard colorimetric method. (Mortland-Battelle)
W74-07565

THE BACTERIAL FLORA OF THE ATLANTIC SALMON (SALMO SALAR L.) IN RELATION TO ITS ENVIRONMENT,
Torry Research Station, Aberdeen (Scotland).
R. W. Horsley.
Journal of Applied Bacteriology, Vol 36, No 3, P 377-386, September 1973. 4 fig, 3 tab, 29 ref.

Descriptors: *Atlantic salmon, *Aerobic bacteria, *Pollutant identification, Methodology, *Bioindicators, *Water quality, Estuarine environment, Fungi, Aquatic environment, Rivers, Coasts, Water analysis, Fishing, Pseudomonas, Enteric bacteria, Yeasts.
Identifiers: Skin, *Heterotrophic bacteria, Gills, Marine environment, Viable count, Swab technique, Sampling technique, Animal tissues, Salmo salar, Culture media, Moraxella, Acinetobacter, Flavobacterium, Cytophaga, Bacillus, Vibrio, Aeromonas, Coryneform bacteria, Micrococcaceae, Enterobacteriaceae, Chromobacterium spp, Actinomycetes.

The aerobic flora of the skin of 56 Atlantic salmon from coastal, estuarine and river waters was analyzed quantitatively; 50 skin and 33 gill samples were analyzed qualitatively. The water at each sampling station was also analyzed. The principal genera on the skin and gills were Moraxella, Flavobacterium, Cytophaga and Pseudomonas; members of Acinetobacter, Bacillus, Aeromonas, Vibrio, the Enterobacteriaceae, Micrococcaceae and some coryneforms were also present. The gill flora was similar to that of the skin, which reflected that of the environment. (Holoman-Battelle)
W74-07567

TAXONOMIC POSITION OF TWO LUMBRINERIS SPP.,
Canterbury Univ., Christchurch (New Zealand). Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W74-07568

MOINA SP. (CLADOCERA: MOINIDAE) IN A SEWAGE PLANT, WELLINGTON, REFERRED TO MOINA TENUICORNIS SARS, 1896 (NOTE),
Wellington City Corp. (New Zealand). Works Dept.
I. L. Vidal.
New Zealand Journal of Marine and Freshwater Research, Vol 7, No 3, p 253-259, September 1973. 1 fig, 1 tab, 6 ref.

Descriptors: *Systematics, *Water quality, *Ecology, *Waterfleas, Water temperature, Alkalinity, Hydrogen ion concentration, Dissolved solids, Biochemical oxygen demand, Organic matter, Sewage lagoons, Nitrates, Phosphorus, Speciation, Physiological ecology, Crustaceans, Scenedesmus, Chlamydomonas, Coliforms, Habitats.
Identifiers: *Moina, *New Zealand, Microtinium, Cryptomonas.

A species of Moina from sewage ponds at Glenside, Wellington, New Zealand, is identifiable/with Moina tenuicornis Sars, 1896, and distinguishable from Moina australiensis Sars, 1896 sensu stricto, in having rectangular sculpturing on the ephippium, ungrouped setae on the hind margin of the carapace, and in lacking a permanent supra-ocular depression. Because of wide variation in some diagnostic characters, possibly both taxa are conspecific. Some physical and chemical characteristics of the habitat are tabulated, since little is known of the ecological requirements of these morphologically similar species. Using mean values as a guide, the Glenside population of Moina tenuicornis favors a temperature in the vicinity of 20 C, a very slightly alkaline pH, a dissolved oxygen content in excess of 6 mg.liter, a dissolved solid content of about 270 mg/liter, of which about half is organic and exerts a BOD sub 5 of about 60 mg/liter, and suspended organic solids of about 150 mg/liter. (Mortland-Battelle)
W74-07569

PRELIMINARY DIAGNOSIS OF A NEW SPECIES OF MARINE ISOPOD FROM STEWART ISLAND,
Oceanographic Inst. (New Zealand). Department of Scientific and Industrial Research, Wellington.
For primary bibliographic entry see Field 2I.
W74-07570

SUMMARY OF THE STATE OF THE ART IN RADIOCHROMATOGRAPHY,
Oslo Univ. (Norway). Inst. of Physics.
S. Prydz.
Analytical Chemistry, Vol 45, No 14, p 2317-2326, December 1973. 12 fig, 2 tab, 54 ref.

Descriptors: *Reviews, *Carbon radioisotopes, *Tritium, Radiochemical analysis, *Radioactivity techniques, Computers, Prices, Films, Cameras.
Identifiers: *Radiochromatography, Film registration, Fluorography, Detectors, Luminescence, Photon detector, Scintillators, Image intensifiers, Scanners, Beta camera, Spark chamber, Beta particles.

Film registration in radiochromatography is discussed. Low-temperature fluorography gives

the lowest detection limits, 3.0 and 0.06 nCi-day/sq cm for tritium and radiocarbon, respectively. Various detectors for one- and two-dimensional scanning, comprising windowless gas-flow GM detectors, solid state detectors, and vacuum-operated channel electron multipliers are treated. The luminescence detection method, applying scintillators in the chromatograph and a scanned photon detector, is discussed. For tritium, the latter method is about 30 times more efficient than GM detection. Two radio-labels may be counted simultaneously using pulse height discrimination. The beta camera, the spark chamber, and the possibility of using image intensifiers are also discussed. The application of a computer to increase the signal-to-noise ratio and, hence the sensitivity, of scanners is mentioned. A comparison of the sensitivities of the available detection techniques and an appendix giving prices and technical details of the commercially available scanners are included. (Mortland-Battelle)
W74-07571

RECOVERY OF ARSENIC BY DRY ASHING FROM ANIMAL TISSUE FORTIFIED WITH ORGANOARSENICALS OR ARSENIC TRIOXIDE,
Salsbury Labs., Charles City, Iowa, Pharmaceutical Development and Analysis Dept.
G. M. George, L. J. Frahm, and J. P. McDonnell.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1304-1305, November 1973. 2 tab, 8 ref.

Descriptors: *Chemical analysis, *Poultry, Methodology, Colorimetry, *Arsenicals(Pesticides).
Identifiers: *Arsenic, *Chemical recovery, *Animal tissues, Organoarsenicals, Arsenic trioxide, Dry ashing, Liver, Kidneys, Roxarsone, Arsanilic acid, Nitarsone, Carbarsone, Arsenobenzene.

A study was conducted to establish whether or not arsenic recovery from animal tissue is independent of arsenic source. Control chicken liver and kidney tissues were fortified with 1.0 or 2.0 ppm arsenic from arsenic trioxide, roxarsone, arsanilic acid, nitarsone, or carbarsone. The tissue samples were dry ashed and total arsenic was determined colorimetrically. Arsenic recovery for the organoarsenical-fortified tissue samples is essentially complete for all drugs tested. Mean recoveries ranged from 98 to 109 percent of the theoretical amount expected. (Holoman-Battelle)
W74-07573

ACID AMMONIUM ACETATE EXTRACTION AND ELECTRON CAPTURE GAS CHROMATOGRAPHIC DETERMINATION OF CARBOFURAN IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
J. H. Caro, D. E. Glotfelty, H. P. Freeman, and A. W. Taylor.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1319-1323, November 1973. 2 fig, 5 tab, 9 ref.

Descriptors: *Pollutant identification, *Soil analysis, Methodology, *Pesticide residues, Carbamate pesticides, Solvent extractions, Insecticides, Soil contamination, Water pollution sources, *Gas chromatography, Soils, Loam, Peat, Chemical analysis.
Identifiers: *Carbofuran, Electron capture gas chromatography, Chemical recovery, Metabolites, Detection limits, Landrin, Propoxur, Bux, Acid ammonium acetate.

A method is presented for determining carbofuran residues in soils that gives improved recovery, especially in weathered soils, and allows quantitation of as little as 0.1 ppm without cleanup. The soil is extracted with 0.5 M acid ammonium acetate and the carbamate in the extract is determined by electron capture gas chromatography as the dinitrophenyl ether. A systematic study was conducted to optimize extraction conditions. In tests of soils fortified with 1 ppm carbofuran, using optimized extraction conditions, recoveries varied with soil type, ranging from 61 percent in a peat to 92 percent in a silt loam. Recoveries of the metabolites 3-hydroxy- and 3-ketocarbofuran from field soils were at least as efficient as by HCl extraction. In addition to carbofuran, other methylcarbamate insecticide residues that may be determined by this method include Landrin, propoxur, and Bux. (Holoman-Battelle)
W74-07574

OBSERVATIONS ON THE GAS CHROMATOGRAPHY OF KELTHANE (DICOFOL),
Food and Drug Administration, Washington, D.C. Div. of Chemistry and Physics.
N. F. Ives.
Journal of the Association of Official Analytical Chemists, Vol 56, No 6, p 1335-1338, November 1973. 4 fig, 12 ref.

Descriptors: *Degradation(Decomposition), *Gas chromatography, Mass spectrometry.
Identifiers: Gas liquid chromatography, *Kelthane, *Sample preparation, Dichlorobenzophenone, Infrared spectrophotometry, Electron capture detector.

Problems associated with the GLC of Kelthane (dicofol) are discussed. The contribution of inlet glass wool to the decomposition of dicofol to p,p'-dichlorobenzophenone is investigated and steps to minimize the problem are suggested. An impurity of the technical material, which eluted immediately after dicofol, was isolated and tentatively identified as 1,1-bis(p-chlorophenyl)-1,2,2,2-tetrachloroethane by infrared and mass spectrometry. (Little-Battelle)
W74-07575

REDUCTION IN MERCURY CONTENT OF FISH PROTEIN CONCENTRATE BY ENZYMATIC DIGESTION,
Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.
M. C. Archer, B. R. Stillings, S. R. Tannenbaum, and D. I. C. Wang.
Journal of Agricultural and Food Chemistry, Vol 21, No 6, p 1116-1117, November/December 1973. 1 tab, 10 ref.

Descriptors: *Mercury, *Reduction(Chemical), *Digestion, Proteins, Separation techniques, Enzymes, Centrifugation, Fish.
Identifiers: *Fish protein concentrate, *Proteolysis, Sample preparation, Swordfish, Pacific hake.

The effect of proteolytic digestion on the distribution of mercury in fish protein concentrate (FPC) has been investigated. A two- to sevenfold concentration of mercury in the insoluble FPC fraction and a corresponding reduction of mercury level in the soluble FPC fraction was achieved after proteolysis. The following commercial enzyme preparations were used: Pancreatin, B grade (porcine pancreas), Calbiochem; Pronase, B grade (Streptomyces griseus), Calbiochem; and Monzyme PA-1 (Bacillus subtilis), Monsanto. FPC samples were prepared from either Pacific hake (Merluccius productus) or swordfish (Xiphias gladius). Ten percent slurries of FPC were digested for periods of 1 and 6 hr at 50 C with Monzyme at pH 8.8 and with Pronase and Pancreatin at pH 8.5. After digestion for 1 or 6 hr, the reaction was stopped by pouring the mixture into two 50-ml centrifuge tubes and spinning down the residue at 4 C for 5 min and 5090 X g. The residue was suspended in distilled water and recentrifuged. The clear supernatants were combined and freeze-dried after most of the water was removed by flash evaporation at a bath temperature of 40 C. The residue was also freeze-dried. The soluble and insoluble fractions were then analyzed for mercury content. (Mortland-Battelle)
W74-07576

A DIRECT COMPARISON OF SATELLITE AND AIRCRAFT INFRARED (10 MICROMETERS-12 MICROMETERS) REMOTE MEASUREMENTS OF SURFACE TEMPERATURE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 7B.
W74-07578

KAEMPFEROL (3,5,7,4'-TETRAHYDROXYFLAVONE) AS A CHROMOGENIC REAGENT FOR TIN(IV),
Delhi Univ. (India). Dept. of Chemistry.
B. S. Garg, and R. P. Singh.
Microchemical Journal, Vol 18, No 5, p 509-519, October 1973. 8 fig, 3 tab, 14 ref.

Descriptors: *Spectrophotometry, *Aqueous solutions, Methodology, *Pollutant identification, Color reactions, Chemical reactions, Chelation, Acidity, Temperature, Time, Cations, Anions, Heavy metals, Organic compounds, Alkaline earth metals, Halides.
Identifiers: *Tin, *Chromogenic reagents, *Kaempferol, Metal chelates, Ionic interference, Sensitivity, Precision, Chemical concentration, Ethanol, Absorption spectra, Rare earth elements.

Tin(IV) forms a deep yellow chelate with the ligand kaempferol in aqueous ethanolic medium. This color reaction has been investigated in terms of using it for the spectrophotometric determination of tin. Those parameters studied were acidity, ethanol, time and temperature, reagent concentration. With the method used, the sensitivity of the color reaction 0.0029 microgram of Sn/sq cm is identical to log I sub o/I equals 0.001, at 430 nm in 0.1 N HCl medium and Beer's law is obeyed up to 3.6 ppm of tin. Several complexing anions do not interfere and they have been used for masking some of the cations which interfere in the determination. (Holoman-Battelle)
W74-07579

MICRODETERMINATION OF RESORCINOL IN PRESENCE OF PHENOL,
Pakistan Council of Scientific and Industrial Research Lahore.
M. Sarwar, and K-U. Butt.
Mikrochimica Acta, No 5, p 679-682, 1973. 2 tab, 12 ref.

Descriptors: *Phenols, *Volumetric analysis, *Aqueous solutions, Water analysis.
Identifiers: *Resorcinol, N-bromosuccinimide, Accuracy.

A displacement titration method using N-bromosuccinimide as the titrant has been devised for estimation of resorcinol in phenol. One ml of the resorcinol test solution is placed in a 50-ml Erlenmeyer flask. One ml of potassium iodide and 0.5-1.0 ml of fresh starch is added. The solution is titrated against 0.01 N solution of N-bromosuccinimide added dropwise from a microburette. The end point is reached when a bluish color appears and persists for 30 seconds. A similar procedure is repeated for the estimation of resorcinol in phenol. The method is very simple, rapid, and accurate. (Mortland-Battelle)
W74-07580

GAS CHROMATOGRAPHIC STUDIES OF MIXED-LIGAND COMPLEXES OF DIVALENT CATIONS,
Hewlett-Packard Co., Avondale, Pa. Avondale Div.
C. A. Burgett.
Journal of Chromatographic Science, Vol 11, No 11, p 611-614, November 1973. 5 fig, 1 tab, 6 ref.

Descriptors: *Cations, *Gas chromatography, *Solvent extractions, Iron, Cobalt, Nickel, Gravimetric analysis, Mass spectrometry, Separation techniques.
Identifiers: *Ligands, Thermogravimetric analysis, Thermal stability, Divalent cations, Chromatograms, Metal complexes, Metal chelates.

Volatile complexes of iron(II), cobalt(II) and nickel(II) are prepared by solvent extraction using the mixed-ligand system 1,1,1,2,2,6,6,7,7,7-decanfluoro-3,5-heptanedione, H(FHD), di-n-butylsulfoxide, (DBSO). The composition of the extracted species is reported to be M(FHD)2. DBSO. Thermogravimetric analysis of the complexes is reported. The complexes were eluted from the gas chromatographic column without decomposition as determined by mass spectrometric detection. Separation of iron(II) and cobalt(II) from nickel(II) was readily achieved; however, iron(II) and cobalt(II) were not separated. (Mortland-Battelle)
W74-07582

NUMERICAL ANALYSIS OF HANSENULA, PICHIA AND RELATED YEAST GENERA,
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.
I. Campbell.
Journal of General Microbiology, Vol 77, No 2, p 427-441, August 1973. 4 fig, 1 tab, 53 ref.

Descriptors: *Systematics, *Speciation, *Numerical analysis, *Yeasts.
Identifiers: Data interpretation, Debaryomyces, Pichia, Wingea, Endomycopsis, Hansenula, Pachysolen, Schwanniomyces, Lipomyces, Ambrosizyma, Brettanomyces, Citeromyces, Dekkera, Ladderomyces.

Numerical analysis of published standard descriptions of the eight species of Debaryomyces, 48 species of Pichia, and the single species of Wingea failed to distinguish separate genera. It is proposed that they be combined as a single genus Pichia of 41 species, three of which were formerly allocated to the genus Endomycopsis. The genus Hansenula, of 20 species including Pachysolen tannophilus and three former species of Endomycopsis, is closely related to the genus Pichia and is distinguished only by the ability of Hansenula species to assimilate nitrate. In the genus Schwanniomyces the number of species is reduced from four to two, and in Lipomyces, from three to one. (Little-Battelle)
W74-07583

RESIDUES OF ATRAZINE, CYANAZINE, AND THEIR PHYTOTOXIC METABOLITES IN A CLAY LOAM SOIL,
Ontario Ministry of Agriculture and Food, Guelph. Pesticides Residue Lab.
G. J. Sirons, R. Frank, and T. Sawyer.
Journal of Agricultural and Food Chemistry, Vol 21, No 6, p 1016-1020, November/December 1973. 6 fig, 2 tab, 11 ref.

Descriptors: *Clay loam, *Pesticide residues, *Degradation(Decomposition), *Triazine pesticides, Persistence, Phytotoxicity, Soil analysis, Herbicides, Methodology, Solvent extractions, Chemical analysis, Chemical reactions.
Identifiers: *Metabolites, *Coulson conductivity detector, Quantitative analysis, Chemical recovery, Atrazine, Cyanazine, Electrolytic conductivity gas chromatography, Deethylated atrazine, Deisopropylated atrazine, Cyanazine amide, Gas liquid chromatography.

The degradation of 2-chloro-4-ethylamino-6-isopropylamino-s-triazine (atrazine) and 2-chloro-4-(1-cyano-1-methylethylamino)-6-ethylamino-2-triazine (cyanazine) was investigated in Perth clay loam soil. Atrazine and cyanazine were applied at rates of 1, 2, and 3 lb/A of active ingredients as pre- and postemergence treatments. Soil was sampled from plots after 0, 2, 3.5, 5, and 12 months at 0-2.5, 2.5-5, and 5-10 in. depths. Atrazine, cyanazine, and their phytotoxic metabolites were extracted with a 65 percent acetonitrile-water mixture and quantitated on a Coulson conductivity detection system. Presented data indicate that atrazine is converted into deethylated atrazine (2-chloro-4-amino-6-isopropylamino-s-triazine) as a major and deisopropylated atrazine (2-chloro-4-amino-6-ethylamino-s-triazine) as a minor phytotoxic metabolite and that cyanazine is changed to deisopropylated atrazine as a major phytotoxic metabolite. Cyanazine amide (2-chloro-4-(1-carbamoyl-1-methylethylamino)-6-ethylamino-s-triazine) was found. It is proposed that the hydrolysis precedes the microbiological degradation to the deisopropylated atrazine. (Holoman-Battelle)
W74-07585

DETERMINATION OF MEAN CELL SIZE OF TETRAHYMENA IN GROWING CULTURES,
University Coll. of Wales, Aberystwyth.
G. A. Morrison, and A. L. Tomkins.
Journal of General Microbiology, Vol 77, No 2, p 383-392, August 1973. 7 fig, 1 tab, 4 ref.

Descriptors: *Cultures, *Populations, *Particle size, *Volume, Growth rates, Cytological studies, Aqueous solutions.
Identifiers: *Coulter counter, *Counting, Tetrahymena pyriformis, Size.

In this study of the actions of certain inhibitors on the growth of Tetrahymena pyriformis in deep culture it was necessary to make concomitant measurements of the number of mean cell size of the living organisms in a culture at intervals. To accomplish this, a Coulter model A was fitted with a 280 micrometer orifice tube to detect decreases in the conductance of a small volume of an aqueous electrolyte. When the setting correspond to detection of every particle, the total count was obtained. The counts at a number of different threshold settings were used to obtain a distribution of particle volume curve and hence to calculate the mean particle volume (electronic volume). The results show that the diluting solution can have an optimal colligative concentration in which there is initially no change of the measurement; in suboptimal concentrations there is initial increase followed by a decrease to a value somewhat less than that prevailing at the moment of dilution (95 percent), whereas in superoptimal concentrations there is initial decrease followed by an increase. If the initial decrease is severe the subsequent increase restores the value to only 80 percent of the original. The measurements of electronic volume, and of its changes reflect the corresponding mean cell volume, and changes of it, estimated by photographic methods. The changes can be accounted for by changes of balance between the elasticity of the cell walls and the osmotic pressure across the walls. (Little-Battelle)
W74-07586

ELEMENTAL VARIABILITY WITHIN A SAMPLING UNIT,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 2K.
W74-07598

5B. Sources Of Pollution

ECOLOGY AND PRODUCTIVITY OF STRIP-MINE AREAS IN MERCER COUNTY, PENNSYLVANIA,
Grove City Coll., Pa. Dept. of Biology.
F. J. Brenner.
Available from the National Technical Information Service as PB-231 559, $4.00 in paper copy, $1.45 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Penn., Completion Report, March 1974. 70 p, 35 fig, 12 tab, 15 ref. OWRR A-029-PA(1). 14-31-0001-4038.

Descriptors: *Strip mines, *Ecology, *Aquatic life, *Fish populations, Water chemistry, Plankton, Reclamation, *Pennsylvania, Productivity, Recreation, *Land reclamation, Wildlife.
Identifiers: *Mercer County(Penn), Recreational development.

Abandoned strip mines were surveyed in Mercer County, Pennsylvania during 1971 and 1972. The general ecology of each strip mine site was determined and the water chemistry of each pool was analyzed. The majority of the strip mine pools within Mercer County are supporting aquatic life. The data on water chemistry, plankton surveys and age and growth of fish populations indicate that these areas offer considerable potential for recreational development. The results of this preliminary study will provide an excellent basis for further research on the fish and wildlife potential of these sites. Furthermore, this research suggests that cooperation between the mine operator, land owner and an ecologist could result in reclamation procedures beneficial for fish and wildlife populations.
W74-07055

CHEMICAL AND BIOLOGICAL PROBLEMS IN THE GRAND CANYON,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
G. C. Slawson, Jr., and L. G. Everett.
In: Hydrology and Water Resources in Arizona and the Southwest, Proceedings of the 1973 meetings of the Arizona Section - AWRA and the Hydrology Section, Arizona Academy of Sciences, May 4-5, 1973, Tucson, Arizona, p 63-72, (1973). 1 fig, 6 tab, 1 ref.

Descriptors: *Water quality, *Biological properties, *Colorado River, Water pollution sources, Chemicals, Bacteria, Pollutants, Tributaries, Public health, Sampling, Salinity, Sediments, Water quality standards.
Identifiers: *Grand Canyon National Park.

Chemical and bacteriological water quality in the Grand Canyon was investigated to determine possible health hazards to river users. Water quality is a function of both time and location and in general, the quality of water in the main river channel is relatively stable and appears to be within acceptable standards. Extreme temporal variability was noted in tributary streams, as a result of summer rains and flooding in the side canyons, and definite health hazards are present during these periods. A more intensive water quality monitoring program is called for to determine the sources of the contamination and to protect and preserve the quality of the Grand Canyon experience. (Mastic-Arizona)
W74-07093

DISSOLVED-SOLIDS DISCHARGE TO THE OCEANS FROM THE CONTERMINOUS UNITED STATES,
Geological Survey, Washington, D.C.
D. K. Leifeste.
Circular 685, 1974. 8 p, 1 fig, 2 tab, 6 ref.

Descriptors: *Dissolved solids, *Rivers, *United States, Data collections, Hydrologic data, Erosion, Water quality, Path of pollutants, Solutes, Oceans.

Dissolved-solids data from 54 river basins for 1966-69 were used to compute the amount of dissolved material contributed to the oceans from the conterminous United States. About 264,000,000 tons are discharged annually. The Gulf of Mexico receives the largest load, about 183,000,000 tons, of which about 157,000,000 tons are contributed by the Mississippi River. The Atlantic Ocean

receives about 37,500,000 tons, and the Pacific Ocean about 43,400,000 tons. Average yearly yields range from 26 to 231 tons per square mile and average about 100 tons per square mile. (Knapp-USGS)
W74-07162

SOURCE AND BUDGET OF SULFATE IN PRECIPITATION FROM CENTRAL ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
P. W. Summers, and B. Hitchon.
Journal of the Air Pollution Control Association, Vol 23, No 3, p 194-199, March 1973. 6 fig, 1 tab, 8 ref.

Descriptors: *Sulfates, *Air pollution, *Path of pollutants, *Chemistry of precipitation, *Precipitation(Atmospheric), Snowfall, Rainfall, *Canada, Meteorology.
Identifiers: Alberta(Canada).

Rain, hail, and snow samples collected in central Alberta were analyzed for sulfate and chloride content. The mean values of sulfate concentration in rain and hail collected in the region of sulfur extraction gas plants were 2.7 mg/liter and 2.9 mg/liter, respectively. The mean value of the sulfate content of a large number of hail samples collected from one severe storm for a major SO2 source was 0.6 mg/liter. Several snow samples collected in Alberta and southern British Columbia had a mean sulfate content of less than 0.5 mg/liter. Most of the sulfate found in central Alberta precipitation is of local industrial origin. By comparing the sulfate deposition in precipitation around one isolated gas plant with the known SO2 emission rate, a local atmospheric sulfur budget was derived. The summertime convective storms are a very efficient mechanism for removing the SO2 from the atmosphere; between 32% and 46% of the sulfur emitted as SO2 arrives at the ground as sulfate sulfur within a radius of 25 miles of the source. In contrast snow is a very inefficient removal mechanism; in winter less than 2% of the sulfur emission is deposited in the snowfall near the source. (Knapp-USGS)
W74-07164

WATER RETENTION OF GRANITIC SOILS IN THE IDAHO BATHOLITH,
Forest Service, (USDA), Ogden, Utah. Intermountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 2G.
W74-07170

GEOLOGIC ASPECTS OF WASTE SOLIDS AND MARINE WASTE DEPOSITS, NEW YORK METROPOLITAN REGION,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
M. G. Gross.
Geol Soc Am Bull. Vol 83, No 11, p 3163-3176, 1972. Illus.
Identifiers: Carbon, Copper, Geologic aspects, Lead, Metropolitan areas, *New York Bight, Silver, *Solid wastes, *Waste disposal.

Waste solids from the New York metropolitan region were a major source of sediment to adjacent ocean areas from 1964-1968. The annual discharge of solids (excluding refuse and floatable debris) to the New York Bight averaged 4.6 million metric tons per yr: 76% from dredged wastes, 12% from construction and demolition rubble, 7.6% from solids in waste chemicals and 4.3% from sewage sludges. Waste containing deposits covered 160 km sq of New York Harbor and more than 50 km sq of continental shelf in New York Bight. The continental shelf area used for waste disposal received no other sediment in quantities sufficient to bury the waste deposits. Waste disposal operations were the largest sediment transport and depositional process active in the mid-Atlantic region. Production of waste solids in the metropolitan region exceeded sediment yields per unit area of any other major drainage basin in the new England-Middle Atlantic area.--Copyright 1973, Biological Abstracts, Inc.
W74-07171

COMPARISON OF CONDITIONAL STABILITY CONSTANTS OF NORTH CAROLINA HUMIC AND FULVIC ACIDS WITH CO(II) AND FE(III),
Geological Survey, Denver, Colo.
R. L. Malcolm.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 79-83, 1972. 1 tab, 5 ref.

Descriptors: *Cobalt, *Iron, *Humic acids, *Fulvic acids, *Estuaries, Chelation, Organic compounds, *North Carolina.
Identifiers: *Metal-organic complexes.

Both humic and fulvic acid fractions of soil and sediment organic matter form stable water-soluble complexes and perhaps chelates with ions of Co(II) and Fe(III). The conditional stability constants (log K values) for these complexes were determined at a constant ionic strength of 1.0 in KC1. The conditional stability constants were 4.0 (pH 4.5) and 6.6 (pH 6.0) for fulvic acid-Co(II) complexes; 6.0 (pH 4.5) and 8.3 (pH 6.0) for humic acid-Co(II) complexes; 5.4 (pH 4.5) and 5.6 (pH 6.0) for fulvic acid-Fe(III) complexes; and 6.8 (pH 4.5) and 7.2 (pH 6.0) for humic acid-Fe(III) complexes. Humic acid-metal complexes may be as important as fulvic acid-metal complexes in geochemical transport of metal ions because they form water-soluble complexes with metal ions, they are more abundant in nature than fulvic acids, and they form more stable metal-organic complexes than corresponding fulvic acid-metal complexes. Fulvic acids form stable complexes with Co(II) in marine and simulated estuarine waters with conditional stability constants of 4.9 and 5.3, respectively; therefore, the formation of metal-organic complexes may be an important factor in considering natural processes in estuarine and marine environments. (See also W74-07225) (Knapp-USGS)
W74-07228

STRONTIUM ISOTOPE COMPOSITION AND SEDIMENT TRANSPORT IN THE RIO DE LA PLATA ESTUARY,
Lamont-Doherty Geological Observatory, Palisades, N. Y.
For primary bibliographic entry see Field 2L.
W74-07240

PROCESSES AFFECTING GAS DISTRIBUTIONS IN ESTUARINE SEDIMENTS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-07242

BIOGEOCHEMICAL VARIABLES IN BOTTOM SEDIMENTS OF THE RAPPHANNOCK RIVER ESTUARY,
South Carolina Univ., Columbia. Coll. of Arts and Sciences.
For primary bibliographic entry see Field 2L.
W74-07244

PREVENTION AND CONTROL OF INFILTRATION AND INFLOW,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-07257

COMBINED SEWER OVERFLOW REGULATOR FACILITIES,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-07258

THE EPA STORMWATER MANAGEMENT MODEL: A CURRENT OVERVIEW,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W74-07265

LAND APPLICATION OF SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 5D.
W74-07266

INTERDISCIPLINARY MODELING IN THE ANALYSIS OF THE SALINITY PROBLEMS OF THE SAFFORD VALLEY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
A. B. Muler.
Water Resources Bulletin, Vol 10, No 2, p 245-255, April 1974. 6 fig, 9 ref.

Descriptors: *Water quality control, Saline water intrusion, *Groundwater, *Irrigation, *Economic efficiency, *Management, Water resources development, Hydrology, Rivers, Social aspects, Aquifers, Agriculture, Cotton, Alfalfa, Model studies, Systems analysis, *Arizona, *Salinity.
Identifiers: Interdisciplinary modeling, Safford Valley(Ariz).

In recent years, there have been significant declines in the quality of groundwater used for irrigation in the Safford Valley, Arizona. Reports of changes over a few weeks from freshwater to brine incited an investigation of the Valley's salinity situation. An interdisciplinary approach was chosen in which the physical, social and economic systems in the Valley were modeled in the classical methods of each field; then a composite flow relationship model was constructed to examine the interrelationship of these systems and identify multiple aspects of the salinity change in the area. The hydrologic study, salinity modeling, and economic analysis are discussed, as well as interdisciplinary implications. The composite model shows that, based on salinity trends, the Valley's principal agricultural crop--cotton--will remain economical to cultivate for a significant time beyond the model's limit of prediction. Alfalfa, however, should go out of production in large areas of the Valley by 1990 and not be under economical cultivation by 2040. The sociologic model, based on the cluster analysis of questionnaire data, shows an awareness of the salinity problems of the area but little concern over them. Interdisciplinary model-based salinity control recommendations are made. (Bell-Cornell)
W74-07297

NONLINEAR PROGRAMMING IN RIVER BASIN MODELING,
Calgary Univ. (Alberta). Faculty of Business.
M. B. Bayer.
Water Resources Bulletin, Vol 10, No 2, p 311-317, April 1974. 3 tab, 31 ref.

Descriptors: *Water quality control, *Model studies, *River basins, Linear programming, *Dynamic programming, Costs, Optimization, Treatment facilities, Biochemical oxygen demand, Dissolved oxygen, Standards, Streams, Systems analysis, *Oregon.
Identifiers: *Nonlinear programming, *Willamette River(Ore).

Since the real world is seldom linear, nonlinear programming is theoretically the ideal method for obtaining solutions for complex water quality problems. The use of nonlinear programming in river basin water quality modeling is explored. Ap-

plications recently reported in the literature, along with the author's experience with nonlinear programming, are reviewed. Several difficulties which still exist in applying the method are discussed. Computational results obtained using linear, dynamic, and nonlinear programming to solve a river basin water quality optimization problem are compared. Data are from Liebman's simplified version of the Willamette River system in Oregon. The water quality models have objective functions with continuous first partial derivatives, and several inequality and variable bound constraints. Results obtained are the efficiencies of treatment plants and the total cost of building or expanding the treatment plants to accommodate specified BOD loads and stream DO standards. Compared are a linear and nonlinear program of Bayer, a dynamic program of Liebman, and a linear program of ReVelle. (Bell-Cornell)
W74-07298

A SYSTEMS ANALYSIS OF WATER QUALITY SURVEY DESIGN,
Clemson Univ., S.C. Coll. of Engineering.
L. C. Wilcox.
Available from the National Technical Information Service as AD-768 865; $3.00 in paper copy, $1.45 in microfiche. Department of the Army Annual Report, U.S. Army Medical Research and Development Command, Washington, D.C., August 1973. 38 p, 5 fig, 1 tab, 4 appen. DADA 17-72-C-2152.

Descriptors: *Water quality, *Surveys, *Design, *Systems analysis, *Industrial wastes, *Monitoring, Pollutants, *Data collections, Simulation analysis, Sewers, Networks, Effluents, Measurement, Sites, Water sampling, Topography, Mathematical models, Resources.
Identifiers: Information management, Munitions manufacture.

In a three-year project, the design of water quality surveys is being investigated by an interdisciplinary team using systems analysis. The first year's progress in formulating and implementing models for munitions manufacturing processes, site topology, measurement resources and a resource matching program is reviewed; included also is a survey of current data handling procedures and recommendations for improvements. The surveys being studied are 15 days long and designed to characterize pollutant types and levels at the site being monitored. Resources available for data collection are limited and a 'best' sampling and analysis program must be chosen to maximize data collection. Moreover, the sites being surveyed are large and include processes with a variety of potential pollutants. Therefore, this investigation seeks to provide an information management system. Each principal process associated with munitions manufacture is modeled to provide a pollutant load as a function of production level. These process models, plus a topological model of the plant site which defines the sewer network, produce the steady-state pollutant load at each point in the sewer network and at the plant effluent points. These are combined with a model defining the United States Army Environmental Health Agency's resources available for measurement, sampling, and analysis. This gives an indication of performance and utilization of resources. Thus, the available personnel, equipment, and services available to USAEHA can be used to a maximum degree, insuring maximum useful information. (Bell-Cornell)
W74-07310

REGIONAL WATER QUALITY MANAGEMENT BY THE GENERALIZED REDUCED GRADIENT METHOD,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
C. L. Hwang, J. L. Williams, R. Shojalashkari, and L. T. Fan.
Water Resources Bulletin, Vol 9, No 6, p 1159-1181, December 1973. 7 fig, 4 tab, 22 ref, append. OWRR-A-038-KAN(5) and B-030-KAN(4).

Descriptors: *Water quality control, *River basins, *Management, *Thermal pollution, *Organic wastes, Optimization, Biochemical oxygen demand, Dissolved oxygen, Water temperature, Standards, Dynamic programming, Mathematical modeling, Systems analysis.
Identifiers: *Nonlinear programming, Cost minimization.

Basin-wide water quality management is considered. A river system receives thermal and organic wastes, and at-source treatment is imposed. The related water quality standards are: minimum DO concentration; maximum allowable BOD concentration; maximum allowable stream temperature; and allowable rise in stream temperature. A general dynamic mathematical model representing the spatial distribution and temporal change of temperature and BOD and DO concentration is presented. Temperature effects on BOD and DO concentrations are also given. The model is highly nonlinear in nature. The optimal management problem involving the model is solved by a recently developed nonlinear programming technique, the generalized reduced gradient (GRG) method. The objective is to minimize the costs incurred when certain levels of water quality standards are to be achieved. Comparison of results obtained by the GRG method vs. dynamic programming, and of results using a more realistic mathematical model vs. a simple model is presented. The analysis procedure can be applied to designing new and examining existing water quality programs, and to study the influence of alternate policies and constraints. (Bell-Cornell)
W74-07311

ON THE DETERMINATION OF TURBULENT DIFFUSIVITY IN SHALLOW WATERS BY AERIAL PHOTOGRAPHY OF FLOATING MARKERS,
Texas A and M Univ., College Station. Dept. of Meteorology.
For primary bibliographic entry see Field 2H.
W74-07316

THE IDENTIFICATION OF THE REACTION PRODUCTS FORMED BY THE OXIDATION OF AQUEOUS AMMONIA WITH POTASSIUM FERRATE VI,
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-07333

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-07334

FUNCTION OF MARSHES IN REDUCING EUTROPHICATION OF ESTUARIES OF THE MIDDLE ATLANTIC REGION,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 5C.
W74-07336

MODULAR WASTEWATER TREATMENT SYSTEM DEMONSTRATION FOR THE TEXTILE MAINTENANCE INDUSTRY,
Linen Supply Association of America. Miami Beach, Fl. and Institute of Industrial Launderers Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-07343

PHOSPHORUS SUPPLY CHARACTERISTICS OF ACID ORGANIC SOILS AS MEASURED BY DESORPTION AND MINERALIZATION,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 2G.
W74-07345

RADIATION SAFETY PROBLEMS IN THE OPERATION OF ATOMIC ELECTRIC POWER STATIONS, (IN RUSSIAN),
I. G. Arkhangel'skaya, M. A. Baranov, N. V. Beskrestnov, M. S. Egorova, and N. G. Gusev.
Gig Sanit. Vol 37, No 4, p 59-63. 1972. (English summary).
Identifiers: Atomic energy, *Electric power plants, Environmental, Operations, *Radiation safety, *USSR.

Radiation safety of both the personnel of atomic electric power stations (AEPS) and the population living in its vicinity was studied. Investigations performed at the Novovoronezhskaya and Beloyarskaya AEPS showed the yearly average irradiation level of the personnel to be within 50% of the maximal permissible doses in the USSR. The pollution levels of the environment, such as the atmosphere, plants, water, etc., serve as a radiation background and are determined by the global falls. Experience of the first 15 yr operation of AEPS in the USSR proves them to be quite safe in respect to irradiation of both the personnel of AEPS and the population of the neighboring territories. Some problems still exist in the construction of large AEPS in the vicinity or within the boundary of large towns.--Copyright 1973, Biological Abstracts, Inc.
W74-07363

POLLUTION CAUSED BY AGRICULTURE,
Norges Veterinarhoegskole, Oslo. Institutt for Naeringsmiddelhygiene.
R. Gudding.
Nor Vet Tidsskr. Vol 84, No 7/8, p 430-436. 1972.
Identifiers: *Agriculture, *Air pollution, Biocides, *Norway, *Soil contamination, Wastes, *Water pollution sources.

Pollution of water, air and soil by agriculture (in Norway) can take place by acid ensilage, rinse water of straw-steeping works, animal and artificial manures, pathogenic microorganisms, biocides, and the common sewer.--Copyright 1973, Biological Abstracts, Inc.
W74-07366

EFFECT OF EFFLUENTS FROM HYDROLYSIS PLANT ON THE SURVIVAL OF TYPHOID FEVER AND DYSENTERY BACTERIA, (IN RUSSIAN),
Meditsinskii Institut, Irkutsk (USSR).
For primary bibliographic entry see Field 5C.
W74-07367

PREDICTING THE QUALITY OF STREAM WATER UNDER CONDITIONS OF OXYGEN DEFICIENCY (O PROGNOZE KACHETVA VODY VODOTOKOV PRI BOL'SHIKH DEFITSITAKH KISLORODA),
M. Ya. Krupnik, and A. I. Shishkin.
Khimiya i Tekhnologiya Tsellyulozy i Bumagi -- Trudy Leningradskogo Tekhnologicheskogo Instituta Tsellyulozno-Bumazhnoi Promyshlennosti, No 28, p 113-118, 1972. 4 fig, 3 ref.

Descriptors: *Waste assimilative capacity, Water pollution effects, Water quality, *Self-purification, Streams, *Aeration, *Oxygen sag, *Dissolved oxygen, Equations, Anaerobic conditions, *Mathematical models, Biochemical oxygen demand, *Pulp wastes, Chemical reactions, Organic wastes, Biodegradation.
Identifiers: Streeter-Phelps equations.

The self-purification capacity of receiving waters for discharged pulp and paper mill effluents is usually evaluated with the aid of the Streeter-Phelps equations, based on the assumption that the mineralization process is a monomolecular reaction. An analysis of these equations indicates that they cannot be applied under extreme oxygen deficiency, i.e., under anaerobic conditions, because they would yield negative values for the concentration of oxygen in plots of dissolved oxygen and hence of BOD changes. A modified system of equations is presented which takes into account the effect of oxygen concentration on the mineralization process. (Stapinski-IPC)
W74-07388

WATER REUSE AND RECYCLE IN KRAFT BLEACHERIES,
CIP Research Ltd., Hawkesbury (Ontario).
For primary bibliographic entry see Field 5D.
W74-07394

MARINE FUNGI ISOLATED FROM A KRAFT PULP MILL OUTFALL AREA,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
L. M. Churchland, and M. McClaren.
Canadian Journal of Botany, Vol 51, No 9, p 1703-1710, Sept. 1973. 5 fig, 5 tab, 21 ref.

Descriptors: *Aquatic fungi, *Pulp wastes, *Water pollution effects, *Water pollution sources, *Canada, *Marine fungi, Fungi, Aquatic microorganisms, Microorganisms, Effluents, Sampling, Bioassay, Discharge(Water), Benthic flora, Water quality, Salinity, Saline water, Hydrogen ion concentration, Stratigraphy, Oceanography, Hydrography.
Identifiers: Kraft mills, Howe Sound(B.C.).

Wood- and leaf-inhabiting marine fungi were collected from two depths near the effluent outlets of a kraft pulp mill in Howe Sound, B.C. Other sites which were not directly affected by pulp mill effluents were also sampled. All groups of fungi grew poorly on baits which rested on the bottom by the mill. At 30 cm depth, Phycomycetes were isolated as frequently from the mill as from control sites. Of the Fungi imperfecti, Monodictys pelagica was isolated more frequently, but Zalerion maritimum less frequently from the mill site than from control sites. Phialophora fastigiata was found solely around the mill discharge site. Ascomycetes were rarely found on panels submerged near the mill. Hydrographic measurements showed that the water temperature at the mill sample site was not affected by the effluent. Salinity and pH were generally lower at the mill than at control sites and may have been responsible in part for the observed distributional differences. (Witt-IPC)
W74-07396

RESIDUALS IN MANUFACTURE OF PAPER,
Resources for the Future, Inc., Washington, D.C.
B. T. Bower, G. O. G. Lof, and W. M. Hearon.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE 1, p 1-16, Feb 1973. Paper 9543. 2 fig, 2 tab.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Water pollution sources, *Waste disposal, *Waste water disposal, *Bleaching wastes, Water pollution control, Pollution abatement, *Byproducts, Specifications.
Identifiers: Tissue papers.

Data are presented on the kinds and amounts of residuals generated in the production of tissue papers. They are shown to be primarily a function of the type of raw material, pulping, bleaching, and papermaking processes employed, and of the end-product specifications. The amounts of residuals discharged may be controlled in principle by altering the product specifications and by converting them to saleable by-products or to other residuals that are less harmful to the environment. (Buchanan-IPC)
W74-07399

A PRELIMINARY DESCRIPTION OF THE PHYSICO-CHEMICAL CHARACTERISTICS AND BIOTA OF THREE STRIP MINE LAKES, SPENCER COUNTY, INDIANA,
Saint Meinrad Coll., Ind. Dept. of Biology.
M. W. Coe, and D. V. Schmelz.
Proceedings of the Indiana Academy of Science, Vol 82, p 184-188, 1972. 4 tab, 14 ref.

Descriptors: Lakes, *Strip mine lakes, *Aquatic life, Water properties, *Water chemistry, *Lake stages, *Aquatic productivity, *Indiana, Missouri, Illinois, United States, Water quality.
Identifiers: Spencer County(Ind).

Three strip mine lakes about 30 years old in Indiana were compared for chemical, physical, and biological characteristics. One of the three was relatively fertile both in organism density and number of genera; the other two were rather sterile. Differences may be explainable by variations in area/volume ratios, basin slopes, and watersheds. The lakes resembled strip mine lakes studied in Missouri and Illinois and can be considered to be in the alkaline stage of recovery. All results reinforced the theory that each strip mine lake is modified chemically, physically, and biotically at its own rate. (Brown-IPC)
W74-07403

A PRACTICAL AND TROUBLE-FREE SEWER SPILL MONITOR,
Prince Albert Pulp Co. Ltd. (Saskatchewan).
For primary bibliographic entry see Field 5D.
W74-07404

THE ESTIMATION OF VERTICAL EDDY DIFFUSIVITIES BELOW THE THERMOCLINE IN LAKES,
California Univ., Davis. Dept. of Physics.
For primary bibliographic entry see Field 2H.
W74-07416

WATER POLLUTION ASPECTS OF STREET SURFACE CONTAMINANTS,
URS Research Co., San Mateo, Calif. Environmental Systems Div.
J. D. Sartor, G. B. Boyd, and F. J. Agardy.
Journal of Water Pollution Control Federation, Vol 46, No 3, p 458-467, March 1974 (Part 1). 1 fig, 7 tab, 4 ref.

Descriptors: *Urban runoff, *Water pollution sources, Water quality, Urban hydrology, Organic matter, Heavy metals, Path of pollutants, Storm water.

Materials commonly found on street surfaces contribute to urban pollution when washed into receiving waters by storm runoff. A study was performed that provides a basis for evaluating the significance of this source of water pollution relative to other pollution sources. The study was designed to include information from communities having a broad range of sizes, geographical locales, and public works practices. Information was developed for major land use areas within the cities. In general, street runoff was/a greater pollutant than sanitary wastewater, at least during storms. The major constituent of street surface contaminants is inorganic, mineral-like matter, similar to common sand and silt. The quantity of contaminant material existing at a given test site depends on the length of time elapsed since the site was last cleaned, either intentionally by sweeping or flushing or by rainfall. A great portion of the overall pollutional potential is associated with the fine solids fraction of the street surface contaminants. Current street cleaning practices are essentially for aesthetic purposes and, even under well-operated and highly efficient street sweeping programs, their efficiency in the removal of the dust and dirt fraction of street surface contaminants is low. Catch basins as they are normaliy used are reasonably effective in removing coarse inorganic solids (coarse sand and small gravel) from storm runoff, but are ineffective in removing fine solids and most organic matter. (Knapp-USGS)
W74-07418

ULTRA-VIOLET ABSORPTION CHARACTERISTICS OF NATURAL WATERS,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
For primary bibliographic entry see Field 2K.
W74-07419

THE CHEMISTRY OF CADMIUM IN NATURAL WATER--II. THE ADSORPTION OF CADMIUM ON RIVER MUDS AND NATURALLY OCCURRING SOLIDS,
Stevenage (England). Water Pollution Research Lab.
For primary bibliographic entry see Field 2K.
W74-07420

EROSIONAL LOSSES OF S-TRIAZINE HERBICIDES,
Pennsylvania State Univ., University Park. Dept. of Soil Chemistry.
J. K. Hall.
Journal of Environmental Quality, Vol 3, No 2, p 174-180, April-June 1974. 4 fig, 2 tab, 15 ref.

Descriptors: *Soil erosion, *Runoff, *Herbicides, *Path of pollutants, *Pesticide residues, Pesticides, Alfalfa, Corn(Field).
Identifiers: *Atrazine.

Erosional losses of two chloro-s-triazines, atrazine and GS13529, were evaluated in 1970 and 1971 from field runoff plots planted to corn and situated on Hagerstown silty clay loam of 14% slope. Losses of a methoxy-s-triazine, GS14254, were assayed in 1971 and 1972 from an alfalfa stand. Herbicides were applied premergent to corn and to dormant alfalfa only once during the initial growing season or initial season of evaluation of two rates, 2.2 and 4.5 kg/ha. Total losses of atrazine during the first and most critical season at the respective rates were 5.0% and 4.8% of that applied; 87% to 93% of this loss resulted within the first month following application. One month after application an average of 35.3% of the applied atrazine remained; five months later an average level of 11.8% was residual. Recovery of GS13529 ranged from 65.5% to 9.8% for the same time period. Runoff losses of GS14254 from alfalfa were inconsequential. Little runoff was obtained from this cropping system, no sediment was ever collected and runoff concentrations of the herbicide were extremely small. Total losses of this herbicide for the year were 0.02 and 0.03% for the respective application rates. (Knapp-USGS)
W74-07421

LAND DISPOSAL OF WASTE GASES: III. SORPTION PATTERNS FROM BURIED GAS INJECTION PIPES,
Arizona Agricultural Experiment Station, Phoenix.
S. Miyamoto, A. W. Warrick, and R. J. Prather.
Journal of Environmental Quality, Vol 3, No 2, p 161-166, April-June 1974. 7 fig, 7 ref.

Descriptors: *Soil disposal fields, *Sorption, *Gases, Air pollution, Soil chemical properties, Waste disposal, *Path of pollutants, *Pipes.
Identifiers: Gas disposal.

The advancement of sorption fronts resulting from the injection of reactive gases into soils through

buried porous pipes was analyzed mathematically and verified experimentally. The sorption front advances in ellipsoidal patterns with faster rates above the pipes in a homogeneous profile. The useful volume of soil is larger for corrugated surfaces than for plane surfaces. The corrugated surface is formed with the highest elevation directly over an injection pipe and the lowest point midway between pipes. When a shallow sorptive layer overlies a nonreactive material, the shape of the front is not circular but extends towards the midpoint between parallel pipes where the most water would infiltrate. The sorption fronts determined experimentally by injecting a dry air and nitrogen dioxide mixture into a small soil tank agreed well with the predicted positions based on an instantaneous reaction. (See also W74-04479 and W74-04480) (Knapp-USGS)
W74-07422

RELATIVE MOVEMENT OF BROMIDE AND NITRATE THROUGH SOILS,
Agricultural Research Service, Durant, Okla. Water Quality Management Lab.
S. J. Smith, and R. J. Davis.
Journal of Environmental Quality, Vol 3, No 2, p 152-155, April-June 1974. 3 fig, 4 tab, 14 ref.

Descriptors: *Leaching, *Path of pollutants, *Nitrates, *Bromides, Biodegradation, Nutrients, Anion exchange, Soils.

Miscible displacement experiments were conducted with eight different surface soils (0-15 cm depth) and their associated subsoils (61-76 cm depth). Results indicate that the movement of bromide relative to that of nitrate is identical in subsoils but variable in surface soils. Differences in relative movement of the two anions may be attributed to microbial activity involving nitrate. With the exception of 5% anion sorption in a Greenville subsoil, anion exclusion values ranged from 5% to 39%, indicating the anions were moving 1.05 to 1.64 times as fast as they would if they had been uniformly associated with all the soil water. The results support the view that bromide has utility for following the potential path of nitrate movement through soils. (Knapp-USGS)
W74-07423

VOLATILITY OF DDT RESIDUES IN SOIL AS AFFECTED BY FLOODING AND ORGANIC MATTER APPLICATIONS,
Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div.
W. F. Spencer, M. M. Cliath, W. J. Farmer, and R. A. Shepherd.
Journal of Environmental Quality, Vol 3, No 2, p 126-129, April-June 1974. 4 tab, 22 ref.

Descriptors: *DDT, *Degradation(Decomposition), *Flooding, *Organic matter, *Pesticide removal, Pesticide residues, Soil chemistry, DDE, DDD, Water pollution control, *California.
Identifiers: Coachella Valley(Calif).

Flooding with and without organic matter additions was evaluated as a means of preferentially degrading residual DDT and thereby changing the ratio of the various isomers and metabolites volatilizing from the soil surface. Flooding for a 7-week period, either with or without manure or alfalfa meal applications, effectively degraded DDT isomers, primarily to the respective DDD isomers, but had little effect on DDE isomers. Both flooding and organic matter decreased the volatility even when soil concentrations were not affected, apparently because of increased adsorption of the compounds by added organic matter or by organic matter in the soil altered by flooding. Minor changes in vapor concentration ratios were accomplished by flooding and organic matter additions, but regardless of treatment, the major constituent evaporating from the surface was DDE. To accomplish significant changes in volatilization patterns, it will be necessary to use such management practices before a major part of the DDT has been degraded to DDE. However, flooding and organic matter treatments will ultimately decrease the total quantity of DDE volatilizing from residual DDT in soils over long time periods because of their effectiveness in degrading DDT to DDD instead of DDE. (Knapp-USGS)
W74-07424

METHYLMERCURY FORMATION IN MERCURY-TREATED RIVER SEDIMENTS DURING IN SITU EQUILIBRATION,
Wisconsin Univ., Madison. Dept. of Soil Science.
L. W. Jacobs, and D. R. Keeney.
Journal of Environmental Quality, Vol 3, No 2, p 121-126, April-June 1974. 2 fig, 4 tab, 26 ref.

Descriptors: *Mercury, *Bottom sediments, Rivers, *Wisconsin, Heavy metals, Poisons, Path of pollutants, Translocation, Bed load, Sediment transport.
Identifiers: *Methyl mercury, Wisconsin River, Fox River(Wis).

Methylmercury (MeHg) production in and Hg loss from sediments treated with mercuric chloride (HgC12) or phenylmercuric acetate (PhHgAc) were studied in two environmentally different river sites (one each on the Wisconsin and Fox rivers). Bulk sediment was collected from each river site, treated with approximately 1, 10, or 100 ppm Hg (oven-dry basis) as HgC12 or PhHgAc, and returned to the river site with untreated controls for 2, 4, or 12 weeks of equilibration with the aquatic environment. After retrieval, the sediments were analyzed for total Hg. Hg losses from stationary sediments were minimal and sediment transport is probably the major source of Hg movement in a river system. In both sediments, more MeHg was produced from PhHgAc than from a similar concentration of HgC12, and MeHg concentration increased as the Hg treatment with either compound was increased. The MeHg concentration increased as the Hg treatment with either compound was increased. The MeHg concentrations found in the Wisconsin River sediments were substantially higher than in the Fox River sediments with a similar Hg treatment. The large differences in MeHg production between these two sediments may be partially attributed to their chemical dissimilarities. The Wisconsin River sediment is acidic and contains more organic materials compared to the Fox River sediment which is more alkaline and contains larger amounts of sulfide sulfur. (Knapp-USGS)
W74-07425

LOSSES OF INORGANIC NITROGEN FROM AQUATIC SYSTEMS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
D. R. Bouldin, R. L. Johnson, C. Burda, and C--W. Kao.
Journal of Environmental Quality, Vol 3, No 2, p 107-113, April-June 1974. 1 fig, 11 tab, 15 ref.

Descriptors: *Nitrogen, *Ponds, *Denitrification, *Ammonia, Sediments, Evaporation, Nitrates, Nitrogen cycle, *New York, Nitrogen compounds.

Loss of NH4 and NO3 from solution was followed over a 2-month period in 6 ponds with the objective of investigating the mechanisms and magnitude of losses of inorganic nitrogen. Biological immobilization of nitrogen was small in relation to the total amount added. Losses of NH4 ranged from 2% to 38% per day. A model based on concentration of ammonium N and water pH was consistent with the experimental data, and the results were in agreement with the hypothesis that the major avenue of NH4 loss was by NH3 volatilization across the air-water interface. Nitrate losses ranged from 7% to 15% per day. The results were consistent with the hypothesis that nitrate loss was primarily by denitrification in the bottom sediments. Models for loss of both ions were derived. The models are based on general chemical and physical parameters which are not peculiar to the ponds studied (that is, depth of water, water pH, and a reduced zone of sediments underlying a thin oxidized layer of sediment). The results suggest that volatilization and denitrification are mechanisms which may account for appreciable losses of N from many bodies of water. (Knapp-USGS)
W74-07426

PREDICTING PESTICIDE RUNOFF FROM AGRICULTURAL LAND: A CONCEPTUAL MODEL,
Environmental Protection Agency, Athens, Ga. Agro-Environmental Systems Branch.
G. W. Bailey, R. R. Swank Jr., and H. P. Nicholson.
Journal of Environmental Quality, Vol 3, No 2, p 95-102, April-June 1974. 4 fig, 47 ref.

Descriptors: *Path of pollutants, *Pesticides, *Runoff, *Mathematical models, Model studies, Rainfall-runoff relationships, Translocation, Erosion, Pesticide kinetics.
Identifiers: Pesticide runoff.

A mathematical model of the dynamic, single-rainfall-event type describes pesticide runoff as a function of pesticide and soil properties, agricultural practices, watershed characteristics, and climatic factors. The conceptual structure of the model includes source term effects, loss of pesticide from the soil surface during runoff producing rainfall events because of mass transfer from soil surface into the moving runoff film and pickup of sediment containing pesticide particulates. (Knapp-USGS)
W74-07427

MINERAL SPRINGS IN THE SUEZ RIFT VALLEY - COMPARISON WITH WATERS IN THE JORDAN RIFT VALLEY AND POSTULATION OF A MARINE ORIGIN,
Israel Atomic Energy Commission, Yavne. Soreq. Nuclear Research Center.
For primary bibliographic entry see Field 2K.
W74-07444

DISPERSION OF CONTAMINATED SEDIMENT BED LOAD,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, and H. F. Cheong.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY11, p 1947-1965, November, 1973. 15 fig, 2 tab, 6 ref.

Descriptors: *Bed load, *Dispersion, *Erosion, *Sedimentation, Hydraulics, Water pollution sources, Radioactivity, Sediment transport, *Path of pollutants.

Dispersion of instantaneously released contaminated bed sediments is analyzed within the framework of a Lagrangian probabilistic model. The time and space concentration distributions, with the parameters computed on the basis of the same rate of mass movement and a constant rate of spread, approach Gaussian form asymptotically. A procedure is suggested for deriving approximations to the envelopes of the distribution curves parameterized by either the time or distance. The method is also applicable when the shape factor of the particle step length distribution takes on nonintegral values greater than one. Where the normality approximation is satisfactory, the critical duration for a given degree of pollution varies in direct proportion to the square root of the distance from the source. Graphical results for the critical time limits for the absorption of radiation from contaminated particles for different positions of the subject are also presented. (Skogerboe-Colorado State)
W74-07446

LEACHING LOSSES OF SULFUR DURING WINTER MONTHS WHEN APPLIED AS GYPSUM, ELEMENTAL S OR PRILLED S,
North Carolina Agricultural Experiment Station, Raleigh.
R. D. Rhue, and E. J. Kamprath.
Agronomy Journal, Vol 65, No 4, p 603-605, July-August, 1973. 4 fig, 2 tab, 12 ref.

Descriptors: *Sulfates, *Sulfur, Sulfur compounds, *Gypsum, Inorganic compounds, *Leaching, Water pollution sources.

Interest has developed in the use of elemental sulfur as a means of maintaining an adequate supply of sulfur where leaching is a problem. Studies were conducted with gypsum, finely divided elemental sulfur, and prilled sulfur on a Wagram loamy sand and a Georgeville silty clay loam to determine the levels of sulfate sulfur resulting from additions of these sources. Sulfate contents of the 0 to 15-, 15 to 30- and 30 to 45-cm depths were determined at various times over aperiod of 200 days after the different sulfur sources were applied in October. Almost all of the sulfate, that added sypsum and that resulting from the oxidation of elemental sulfur, had been leached from the top 45 cm of the Wagram soil 180 days after application. There was essentially no movement of sulfate, however, in the Georgeville soil. Very little oxidation of prilled sulfur appeared to be occurring in either soil. (Skogerboe-Colorado State)
W74-07449

AN EXPLANATORY WORK ON THE OXIDATION OF AMMONIA BY POTASSIUM FERRATE (VI),
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W74-07454

INSTABILITY OF WATER COOLED FROM ABOVE,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
For primary bibliographic entry see Field 2H.
W74-07458

AMMONIUM AND NITRATE UPTAKE BY CORN (ZEA MAYS L.) AS INFLUENCED BY NITROGEN CONCENTRATION AND NH4(+)/NO3(-) RATIO,
Michigan State Univ., Lansing.
For primary bibliographic entry see Field 3F.
W74-07459

MORE HEAT THAN LIGHT: THERMAL POLLUTION VERSUS HEAT ENERGY UTILIZATION,
Snessard L. Holland Law Center, Gainesville, Fla.
F. E. Maloney.
University of Florida Law Review, Vol 25, p 693-718, 1973. 207 ref. OWRR A-999-FLA(6).

Descriptors: *Thermal power, *Thermal pollution, *Water pollution, *Water pollution sources, *Pollutant identification, Thermal capacity, Water pollution control, Pollution abatement, Legal aspects, Heated water, Nuclear powerplants, Water temperature, Rivers and Harbors Act.
Identifiers: Federal Water Pollution Control Act.

Heat discharges from electric generating plants, both fossil-fueled and nuclear, have become known as thermal pollution because of their tendency to adversely affect aquatic ecology. Courts applying common law doctrines have universally deemed such discharges to be pollution. A substantial number of state pollution statutes include heat in the definition of pollution, and the Federal Water Pollution Control Act amendments will require each state to establish thermal pollution standards. A recent case defined refuse as including thermal discharges, thereby allowing enforcement against such discharges under the Rivers and Harbors Act. Control in the future over thermal discharges will be accomplished through licensing requirements at both the state and federal level. In addition, comprehensive power plant siting legislation can force pre-selection planning to avert or minimize harm from waste heat discharges. Another method of preventing thermal heat from becoming thermal pollution is to incorporate beneficial uses of the discharge into the powerplant's operation. The potential beneficial use of thermal discharges is limited only by technological imagination. Florida's Aquaculture Law is an example of a legal framework for encouraging this type of development, providing authority to lease submerged lands for aquaculture purposes. (Ritchie-Florida)
W74-07465

SOME ASPECTS OF THE TEMPERATURE, OXYGEN AND NUTRIENT DISTRIBUTIONS IN MONTEREY BAY, CALIFORNIA. ANNUAL REPORT, PART 1, 1973,
Moss Landing Marine Labs., Calif.
For primary bibliographic entry see Field 5C.
W74-07469

NUTRITIVE IMPORTANCE AND STRUCTURE OF DETRITUS,
For primary bibliographic entry see Field 5C.
W74-07471

AN INVESTIGATION OF THE PHYSICAL IMPACT OF SEWAGE OUTFLOW ON A RIVER-ESTUARINE ENVIRONMENT,
Naval Academy, Annapolis, Md.
For primary bibliographic entry see Field 5C.
W74-07477

A STUDY OF THE MOVEMENT OF PHOSPHOROUS IN THE LITTLE RIVER ESTUARY, N.S.W.,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
M. S. Giles.
Report AAEC/TM-616, October 1972. 22 p, 7 fig, 2 tab, 16 ref.

Descriptors: *Absorption, *Radioisotopes, *Phosphorus, *Estuaries, Phytoplankton, Chlorophyll, Zooplankton, Dissolved oxygen, Nuclear wastes, Movement, Tritium, Tracers, Food chains, Metabolism, Photosynthesis, *Australia.
Identifiers: Little River(N.S.W.), Phosphorus-32.

Knowledge of the physical and biological modes of dispersion of radioactivity and of how released radioactivity can progress through food chains, sometimes with a concentration factor, is necessary in order to determine the rates at which the various steps in this cycle occur so that dispersion or concentration may be predicted. The estuary of the Little River, N.S.W. was mapped and measurements made of phytoplankton productivity, phosphorus content, chlorophyll-a content, zooplankton biomass, salinity, temperature, and oxygen content. Phosphorus-32 and hydrogen 3 were injected into the estuary and the rate of phosphorus-32 movement into the phytoplankton and zooplankton calculated. Soluble P-32 in the estuary moved rapidly into the phytoplankton with a turnover time of about two hours. Phosphorus-32 incorporated into the phytoplankton was found to be dispersed and diluted in the same way as tritiated water released at the same time. Movement of P-32 into the zooplankton was much slower. During a tidal phase of the estuary, P-32 taken up by the phytoplankton (comprising at least 90% of the total isotope released) was flushed from the system. During the same phase P-32 in the zooplankton was retained in the estuary. (Jones-Wisconsin)
W74-07483

PROCEEDINGS 2ND ANNUAL TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.
For primary bibliographic entry see Field 2L.
W74-07491

A STRATEGY FOR MODELING PRIMARY PRODUCTION IN STRATIFIED FJORDS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-07494

PHYSICAL MODELING OF RESIDENCE TIMES IN TIDAL BASINS,
Alaska Univ., College. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W74-07496

SUPPLY OF TERRIGENOUS MATERIAL TO THE BALTIC SEA (PITANIYE BALTIYSKOGO MORYA TERRIGENNYM MATERIALOM),
Akademiya Nauk SSSR, Kaliningrad. Institut Okeanologii.
For primary bibliographic entry see Field 2J.
W74-07501

BROMINE IN GROUNDWATER OF UZBEKISTAN (BROM V PODZEMNYKH VODAKH UZBEKISTANA),
Institute of Hydrogeology and Engineering Geology, Tashkent (USSR).
For primary bibliographic entry see Field 2K.
W74-07505

GROUND-WATER FLOW PATTERNS IN CONFINED AQUIFERS AND POLLUTION,
Iowa State Water Resources Research Inst., Ames.
D. Kirkham, and R. R. Van der Ploeg.
Journal of the American Water Works Association, Vol 66, No 3, p 192-197, March 1974. 9 fig, 13 ref. OWRR B-019-IA(6).

Descriptors: *Flow nets, *Artesian aquifers, *Groundwater movement, *Path of pollutants, Aquifers, Aquifer characteristics, Hydrogeology, Steady flow.
Identifiers: Confined aquifers.

A flow net may be made for an arbitrarily shaped, confined aquifer from which water is drawn by means of a well. A knowledge of the shape of the aquifer and the hydraulic head on the boundaries of the aquifer, which are not impervious, is required. Flow nets for a number of elliptical-shaped confined aquifers, by which naturally occurring aquifers may be approximated, are presented. At points in the aquifer where the velocities are low (streamlines far apart), a source of pollution will not be as dangerous as an equal source placed at a location in the pumped aquifer where the velocities are high (streamlines close together). The theory is valid for any shape of aquifer and any diameter of well for any location of the well in the aquifer. The steady-state results indicate approximately what happens under non-steady-state conditions. (Knapp-USGS)
W74-07510

WINTER-REGIME THERMAL RESPONSE OF HEATED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
P. P. Paily, E. O. Macagno, and J. F. Kennedy.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY4, Paper 10479, p 531-551, April 1974. 9 fig, 1 tab, 13 ref, 3 append. OWRR B-018-IA(2), NSF Grant GK-35910X.

Descriptors: *Thermal pollution, *Ice cover, *Rivers, *Melting, Thermal powerplants, Mixing, Water temperature, Heated water, Path of pollutants, Dispersion.
Identifiers: Ice prevention, Ice control.

The increase in water temperature in natural streams due to waste heat disposal from thermal powerplants leads to extensive ice-free reaches during winter periods. The surface heat exchange between water and the atmosphere can be expressed, for most practical purposes, as a linear function of the water temperature. Using this approximation, a closed-form solution of the one-dimensional unsteady convection-diffusion equation was developed to predict temperature distributions in streams and the lengths of ice-free reaches downstream from the thermal discharge sections. (Knapp-USGS)
W74-07511

SALT DISPLACEMENT INTO DRAIN TILES UNDER PONDED LEACHING,
Arizona Univ., Tucson. Dept. of Soils, Water, and Engineering.
For primary bibliographic entry see Field 2G.
W74-07518

AN EXPERIMENTAL STUDY OF IMMISCIBLE DISPLACEMENT WITH AN UNFAVORABLE MOBILITY RATIO IN POROUS MEDIA,
Purdue Univ., Lafayette, Ind. School of Chemical Engineering.
For primary bibliographic entry see Field 2F.
W74-07524

QUALITY OF WATER DISCHARGED FROM TWO AGRICULTURAL WATERSHEDS IN SOUTHWESTERN IOWA,
Agricultural Research Service, Council Bluffs, Iowa. North Central Watershed Research Center.
R. E. Burwell, G. E. Schuman, R. F. Piest, R. G. Spomer, and T. M. McCalla.
Water Resources Research, Vol 10, No 2, p 359-365, April 1974. 5 tab, 15 ref.

Descriptors: *Water quality, *Sediment yield, *Soil conservation, Land management, *Iowa, Pesticides, Contour farming, Terracing, Farm management.

To evaluate the influence of the level-terrace conservation practice on water, sediment, and plant nutrients discharged in surface runoff and base flow, data obtained from this watershed were compared with data obtained from a 33.6-ha contour-planted corn-cropped watershed near Treynor, Iowa. The quality of water discharged from the 157.5-ha diversified conservation-farmed watershed in southwestern Iowa was within acceptable limits for potable water except for the levels of ammonia, inorganic phosphorus, and coliform. Total coliform levels exceeded the established criteria on two occasions, and fecal coliform once during the 2-year study. Nutrient concentration was high occasionally, but the nutrient quantities discharged from the watershed were low, showing the effectiveness of the level-terrace system in controlling surface runoff and erosion. Atrazine residue in the runoff and sediment was detected in only one sample. Even though several chlorinated hydrocarbon and organophosphate compounds had been applied to the watershed, none was detected in runoff or sediment. A comparison of the data from the 33.6-ha contour-farmed watershed with the data from the 157.5-ha well-planned conservation watershed showed the benefits and necessity of controlling runoff and erosion to prevent loss of agricultural chemicals. (Knapp-USGS)
W74-07528

DISTRIBUTION AND CHEMISTRY OF PHOSPHORUS IN AN ALBAQUALF SOIL AFTER 82 YEARS OF PHOSPHATE FERTILIZATION,
Missouri Agricultural Experiment Station, Columbia.
C. W. Kao, and R. W. Blanchar.
Journal of Environmental Quality Vol 2, No 2, p 237-240, April-June 1973. 2 fig, 3 tab, 25 ref. OWRR A-031-MO(3) 14-31-0001-3225.

Descriptors: *Phosphates, Phosphorus, *Phosphorus compounds, Groundwater, Water pollution sources, *Distribution, *Path of pollutants, Soils, Loan.
Identifiers: *Albaqualf soils).

The distribution of P in a fertilized and unfertilized Mexico silt loam soil was measured. After 82 years of P fertilization, the added P was found in Ap (0-23 cm), smaller amounts in the A and B, and B2 (23-86 cm), and large amounts in the B3 and upper C (86-137 cm) horizons. In the fertilized soil the distribution of P, particularly inorganic and available, was similar to that of original P in the soil profile. The P adsorption capacities of fertilized and unfertilized soils were similar. These data indicated that the soil fertilized with P for 82 years had nearly double the total P content, but the ability of the soil to adsorb additional P was the same. Ion products indicated that the P level in the soil solution was controlled by the solubility of strengite.
W74-07532

POPULATION DYNAMICS OF PROTOZOA ASSOCIATED WITH THE DECAY OF ORGANIC MATERIALS IN FRESH WATER,
Bonn Univ. (West Germany). Institut fuer Landwirtschaftliche Zoologie und Bienenkunde.
For primary bibliographic entry see Field 5C.
W74-07541

REACTIONS OF CHLORAMINES WITH ACTIVE CARBON,
Greeley and Hansen, Chicago, Ill.
R. C. Bauer, and V. L. Snoeyink.
Journal Water Pollution Control Federation, Vol 45, No 11, p 2290-2301, November 1973. 8 fig, 12 ref.

Descriptors: *Chemical reactions, *Activated carbon, *Nutrient removal, Ammonia, Nitrogen compounds, Chlorination, Chlorine, Hydrogen ion concentration.
Identifiers: *Chloramines, Monochloramine, Dichloramine, Chlorine residual, Trichloramine.

The purpose of this study was to determine the nature of the NH2Cl-active carbon and NHC12-active carbon reactions. These reactions are of importance if carbon is to be used to eliminate combined residual chloride from an effluent and if it is to aid in the oxidation of NH3-N to N2. The tests were performed in small-scale batch systems with pH control being used to maintain either NH2Cl or NHC12 as the predominant species in the C1-NH3 solution. NHC12-N is readily oxidized by carbon to N2. NH2C1-N is reconverted to ammonia by fresh carbon; however, carbon that has an accumulation of surface oxides, which develop through reaction of free and combined chlorine with carbon, will partially oxidize NH2C1-N to N2. (Mortland-Battelle)
W74-07544

HYDROGEN SULFIDE PRODUCTION BY SYNECHOCOCCUS LIVIDUS Y52-SI,
Montana Univ., Missoula. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-07546

EFFECT OF LIGHT INTENSITY AND GLYCEROL ON THE GROWTH, PIGMENT COMPOSITION, AND ULTRASTRUCTURE OF CHROOMONAS SP.,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
For primary bibliographic entry see Field 5C.
W74-07548

A CONTINUOUS CULTURE STUDY OF PHOSPHATE UPTAKE, GROWTH RATE AND POLYPHOSPHATE IN SCENEDESMUS SP.,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
For primary bibliographic entry see Field 5C.
W74-07549

THE CHEMICAL FORM AND BODILY DISTRIBUTION OF MERCURY IN MARINE FISH,
Tohoku Univ., Sendai(Japan). Dept. of Public Health.
For primary bibliographic entry see Field 5A.
W74-07551

THE PHOTOCHEMISTRY OF CARBAMATES. I. THE PHOTODECOMPOSITION OF ZECTRAN: 4-DIMETHYLAMINO-3,5-XYLYL-N-METHYL CARBAMATE,
New Brunswick Univ., Fredericton. Dept. of Chemistry.
P. J. Silk, and I. Unger.
International Journal of Environmental Analytical Chemistry, Vol 2 No 3, p 213-220, February 1973. 1 tab, 11 ref.

Descriptors: *Carbamate pesticides, *Pollutant identification, Methodology, Laboratory tests, Degradation(Decomposition), Insecticides, Irradiation, Mass spectrometry, Nuclear magnetic resonance.
Identifiers: *Zectran, *Photodecomposition, *Photoproducts, *Fate of pollutants, Photochemistry, Infrared spectra, NMR spectra, Mass spectra, Degradation products, Thin layer chromatography, 4-Dimethylamino-3 5-dimethyl phenol, 4-Hydroxy-2 6-dimethyl-N-methyl benzamide, 4-Monomethylamino-3 5-xylyl-N-methyl carbamate, Infrared spectrophotometry, Sample preparation.

The photodecomposition of 4-dimethylamino-3,5-xylyl-N-methyl carbamate (Zectran) in aerated and degassed solution has been carried out. Three major photoproducts were detected and characterized to be: 4-dimethylamino-3,5-dimethyl phenol, 4-hydroxy-2,6-dimethyl-N-methyl benzamide and 4-monomethylamino-3,5-xylyl-N-methyl carbamate. The phenol and benzamide products suggest that one of the pathways of photodecomposition of Zectran is via a photo-Fries rearrangement. The ortho-benzamide (5-dimehylamino-4,6-dimethyl-2-hydroxy-N-methyl benzamide) which could also be expected to occur in a photo-Fries reaction, was not observed. The excitation wavelength was greater than 296.7 nm, i.e. radiation available in the solar spectrum. Thus the products observed in this study may be expected to occur in the environment as a result of the action of sunlight on Zectran. (Holoman-Battelle)
W74-07552

DETERMINATION OF OIL CONCENTRATION AND SIZE DISTRIBUTION IN SHIP BALLAST WATERS. METHOD AND REPRESENTATIVE RESULTS,
Hydronautics Inc., Laurel, Md.
F. E. Witmer, and A. Gollan.
Environmental Science and Technology, Vol 7, No 10, p 945-948, October 1973. 8 fig, 6 ref.

Descriptors: *Oily water, *Separation techniques, Dispersion, Surfactants, Stabilization, Emulsions, Analytical techniques, Turbidity, Oil, Distribution, Photography, Microscopy.
Identifiers: *Light transmittance, *Microscopic photography, Ballast water, Droplet size, Crude oil, Bunker C oil.

Straightforward techniques to determine the state of dispersion - i.e., quantity and droplet size distribution - for oily ballast waters are outlined. Oil concentrations were determined by using light transmittance through an ultrasonically emulsified, surfactant-stabilized sample, while oil droplet size distributions were directly measured using a microscopic photography cell. When these techniques were applied to actual deballasting operations, it was confirmed that oily ballast clarifiers for crude oil tankage must be able to handle oil fines that are as small as microns in diameter along with very high levels of oil contamination which may exceed 10 percent on occasion. The concentration of crude and Bunker 'C' oil (10-5000 ppm) in distilled water samples was reproducibly measured on a turbidity meter. The instrument consisted of a light source, sample holder cell, an ultrasonic emulsifier, and a photocell. Transmitted light was used to make the measurement. Since output was sensitive to the oil type, calibration curves have been obtained with standards produced from Kuwait, and Venezuela crudes and Bunker 'C'. The droplet size distribution apparatus consists of a small transparent flow cell 1/4 in. wide by 3/8 in. mounted on a microscope platform. Photographs are taken of the sample stream while it flows through the cell. The optical system consists of a direct light source (transmitted through the sample cell), microscope barrel and reflex camera. The microscope and light source have been mounted to a shock-insulated platform to facilitate field use. (Mortland-Battelle)
W74-07564

ACETYLENE REDUCTION BY BEIJERINCKIA UNDER VARIOUS PARTIAL PRESSURES OF OXYGEN AND ACETYLENE,
Ibadan Univ. (Nigeria). Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W74-07572

IN VITRO FORMATION OF NITRATE REDUCTASE USING EXTRACTS OF THE NITRATE REDUCTASE MUTANT OF NEUROSPORA CRASSA, NIT-1, AND RHODOSPIRILLUM RUBRUM,
Oakland Univ., Rochester, Mich. Dept. of Biological Sciences.
P. A. Ketchum, and C. L. Sevilla.
Journal of Bacteriology, Vol 116, No 2, p 600-609, November 1973. 6 fig, 3 tab, 25 ref.

Descriptors: *Laboratory tests, Biochemistry, Assay, Nitrates, Molybdenum, Hydrogen ion concentration, Fungi, Bacteria.
Identifiers: *Nitrate reductase, *Biosynthesis, *Cell extracts, *In vitro synthesis, Neurospora crassa, Rhodospirillum rubrum, Subcellular components, Enzyme activity, NADPH-nitrate reductase, FADH2-nitrate reductase, MVH-nitrate reductase, Mutants, Sample preparation, Bacterial physiology.

In vitro formation of reduced nicotinamide adenine dinucleotide phosphate (NADPH)-nitrate reductase (NADPH: nitrate oxido-reductase, EC 1.6.6.2) has been attained by using extracts of the nitrate reductase mutant of Neurospora crassa, nit-1, and extracts of either photosynthetically or heterotrophically grown Rhodospirillum rubrum, which contribute the constitutive component. The in vitro formation of NADPH-nitrate reductase is characterized by conversion of the flavin adenine dinucleotide (FAD) stimulated NADPH-cytochrome c reductase, contributed by the N. crassa nit-1 extract from a slower sedimenting form (4.5S) to a faster sedimenting form (7.8S). The 7.8S NADPH-cytochrome c reductase peak coincides in sucrose density gradient profiles with the NADPH-nitrate reductase, FADH2-nitrate reductase and reduced methyl viologen (MVH)-nitrate reductase activities which are also formed in vitro. The constitutive component from R. rubrum is soluble (both in heterotrophically and photosynthetically grown cells), is stimulated by the addition of 0.0001 M Na2MoO4 and 0.01 M NaNO3 to cell-free preparations, and has variable activity over the pH range from 3.0 to 9.5. The activity of the constitutive component in some extracts showed a threefold stimulation when the pH was lowered from 6.5 to 4.0. The constitutive activity appears to be associated with a large molecular weight component which sediments as a single peak in sucrose density gradients. However, the constitutive component from R. rubrum is dialyzable and is insensitive to trypsin and protease. These results demonstrate that R. rubrum contains the constitutive component and suggests that it is a low molecular weight, trypsin- and protease-insensitive factor which participates in the in vitro formation of NADPH nitrate reductase. (Holoman-Battelle)
W74-07577

RESIDUES OF ATRAZINE, CYANAZINE, AND THEIR PHYTOTOXIC METABOLITES IN A CLAY LOAM SOIL,
Ontario Ministry of Agriculture and Food, Guelph. Pesticides Residue Lab.
For primary bibliographic entry see Field 5A.
W74-07585

PHARMACODYNAMICS OF METHYL MERCURY IN THE RAINBOW TROUT (SALMO GAIRDNERI): TISSUE UPTAKE, DISTRIBUTION AND EXCRETION,
State Univ. of New York, Buffalo. Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W74-07597

5C. Effects Of Pollution

DISTRIBUTION AND STANDING CROPS OF CHIRONOMID-LARVAE IN SHIOZU BAY OF LAKE BIWA (IN JAPANESE),
M. Hiro, and M. Sato.
Jap J Limnol, Vol 33, No 2, p 21-28, 1972, Illus, English summary.
Identifiers: Bays, *Chironomid larvae, Chironomus-plumosus, Distribution, *Japan(Lake Biwa), Phaenopsectra, *Standing crops.

The distribution pattern and the standing crops of chironomid-larvae were investigated at Shiozu Bay of Lake Biwa (Japan). The bottom was sampled 4 times through the year; April, Aug., Oct., 1968 and Jan., 1969. Phaenopsectra sp. B, Phaenopsectra sp. C, Procladius sp. B and so on were dominant species next to Chironomus plumosus. Most species lived in the mud, some of them in gravel, and are distributed on bottoms shallower than 30 m. None were found on the sand bottom. Phaenopsectra sp. B is very widely distributed from the lake-side to a depth of about 60 m. The number of investigations for sampling by a bottom sampler are 2.3-3.8 times for C. plumosus and 46.2-66.3 times for Phaenopsectra sp. C, in 50% confidence limits, respectively. C. plumosus was dissected for the examination of food habit. In the 5 examples, some algae were recognized in the alimentary canal.--Copyright 1973, Biological Abstracts, Inc.
W74-07101

FACTORS AFFECTING PHYTOPLANKTON PRODUCTION IN A EUTROPHIC RESERVOIR,
Naval Academy, Annapolis, Md. Div. of Mathematics and Science.
B. L. Kimmel.
Arch Hydrobiol Vol 71, No 1, p 124-141. 1972.
Identifiers: *Eutrophication, *Nutrients, Phosphates, *Phytoplankton, Reservoirs, *Productivity.

Phytoplankton production averaged 857 mg C m-2 day-1 and 390 mg C m-3 day -1. Variation in phytoplankton productivity and environmental factors affecting productivity occurred among the reservoir areas sampled. Nutrient limitation was minor near points of tributary inflow, but production was limited by phosphate availability in the reservoir's main body.--Copyright 1973, Biological Abstracts, Inc.
W74-07121

LAUNDRY DETERGENTS AND ENVIRONMENTAL QUALITY,
Indiana Univ., Bloomington. Poplars Research and Conference Center.
R. S. Howe, J. G. Morris, and H. W. Poston.
Occasional Papers No 2, May 1973. 25 p, 8 fig, 9 tab, 15 ref.

Descriptors: *Detergents, *Phosphates, *Sewage treatment, *Laundering, Formulation, Safety, Effluents, Illinois, Standards, Legislation, Prices, Capital costs, Operating costs, Judicial decisions.
Identifiers: *Chicago(Ill), Nonphosphate detergents, Cleaning ability, Phosphorus removal costs.

The laundering effectiveness, public hazards, and costs between a public policy requiring a laundry product reformulation and treatment measures to reduce phosphates discharged into the environment are compared. Detergents having different phosphate levels are evaluated with respect to safety, cleaning ability, and effect on phosphate effluent level. Reports, including those of the Chicago Board of Health and the Food and Drug Administration, indicate that no additional health hazards are created by use of non-phosphate detergents. Similarly, comparison of alternative detergent formulations reveal comparable soil removal abilities. Chicago consumers' response to the nonphosphate detergents provides another indicator of acceptable performance. Surveys in other jurisdictions having legislated against detergents having high phosphate levels indicate favorable responses. Examination of effluent data in these areas also indicates improvements in water quality. In Erie County, New York, for example, a reduction of phosphate contents to zero percent between 1970 and 1972 has resulted in total phosphate and biochemical oxygen demand reductions of 44 and 48% respectively. Evaluation of consumer price fluctuations indicates no significant relationship with policy change. Overall, product reformulation appears to have lower direct cost in compliance with effluent standards requiring phosphorus concentrations of less than 1.0 mg/l. (Schroeder-Wisconsin)
W74-07122

BIOCHEMISTRY OF SELECTIVE TOXICITY AND BIODEGRADABILITY: COMPARATIVE O-DEALKYLATION BY AQUATIC ORGANISMS,
Illinois Univ., Urbana. Dept. of Entomology.
L. G. Hansen, I. P. Kapoor, and R. L. Metcalf.
Comp Gen Pharmacol Vol 3, No 11, p 339-344. 1972.
Identifiers: Aquatic animals, Biochemistry, DDT, *Dealkylation, Degradability, *Gambusia-Affinis, Larvae, Minnow, Mosquito, Snails, *Toxicity, *Biodegradation.

Female Gambusia affinis have a greater capacity for O-dealkylation of p-nitrophenyl ethers and DDT analogues and the formation of acid-labile conjugates than do mosquito larvae, fat-head minnows, or 2 species of pulmonate snails. The p-nitrophenyl ethers are O-de-ethylated most readily by all species, while the DDT analogues are O-demethylated most readily. Fish absorb the greatest amount of insecticide in a 24 hr period; the excretion rate is highest in Gambusia and lowest in the minnow. The toxicity of DDT analogues correlates with metabolism data, except in snails, which are naturally tolerant to chlorinated hydrocarbons.--Copyright 1973, Biological Abstracts, Inc.
W74-07126

THE PREDICTED INFLUENCE OF KRAFT MILL EFFLUENT ON THE FISHERY RESOURCES,
Oregon State Univ., Corvallis. Sea Grant Marine Advisory Program.
H. F. Horton, and L. P. Parrish.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon, Oregon Agricultural Experiment Station, Special Report 348, February 1972. p 33-64, 3 fig, 11 tab. WP-00107.

Descriptors: *Estuarine fisheries, *Water pollution effects, *Economic impact, Sport fishing, Recreation, Pulp wastes, Lethal limit.
Identifiers: *Yaquina Bay(Ore.).

Biological losses to recreational fishing caused by kraft mill effluent (KME) were examined for Yaquina Bay, Oregon. An angler survey conducted to determine principal sports fishes and invertebrates and their distribution in the bay found white seaperch to be the most important of the total estimated catch, followed by starry flounder and pile seaperch. Bioassays were conducted to determine the 48 and 96-hour median tolerance limit value of KME for each species. The maximum allowable KME for each species tested, computed with an application factor of 1/10 of the 48-hr median TL was: white seaperch 1.7%, striped seaperch 1.7%, starry flounder 2.5%, English sole 1.9% and kelp greenling 3.1%. Using each of these test elements and an earlier prediction of KME concentration the impact of several alternative waste disposal methods and sites on the fishing resource was estimated. Additional data is necessary to better apply bioassay results to various water quality situations which should include better knowledge of the avoidance reaction of estuarine fish to various dilutions of KME. Tests must also be comducted on the impact of KME on the food chain and on the taste of fish. (See also W74-07142) (Schroeder- Wisconsin)
W74-07145

EFFECTS OF MAN-MADE WORKS ON THE HYDRAULIC, SALINITY, AND SHOALING REGIMENS OF ESTUARIES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Div.
H. B. Simmons, and F. A. Herrmann, Jr.
In: Environmental Framework of Coastal Plain Estuaries; 18th Annual Meeting of Southeastern Section of the Geological Society of America, April 10-11, 1969, Columbia, S C: Geological Society of America, Inc, Memoir 133, p 555-570, 1972. 15 ref.

Descriptors: *Estuaries, *Water circulation, *Sedimentation, *Water control, *Environmental effects, Dams, Dredging, River training, Flood control, Levees, Reservoir operation, *Salinity, Streamflow, *Southeast U.S.
Identifiers: Shoaling regimens.

Within the relatively recent past, many works of man have been constructed in estuaries and in their freshwater tributaries in the interest of improving navigating conditions, or regulating the river flow for hydroelectric power generation and flood control. In some cases such works have produced major and sometimes undesirable changes in the hydraulic, salinity, and shoaling characteristics of the estuaries involved. The undesirable effects have in some cases been so drastic that the overall effects may have been detrimental rather than beneficial. The works of man have influenced the hydraulic, salinity, and shoaling regimens in the passes of the Mississippi River, the lower Savannah River, and Charleston Harbor. The histories of these changes strongly recommend that any proposed changes should be thoroughly evaluated by all practicable means before their implementation to insure that the proposal will be beneficial to the system as a whole. (See also W74-07225) (Knapp-USGS)
W74-07249

EFFECT OF INCREASING DEPTH ON SALINITY IN THE JAMES RIVER ESTUARY,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2L.
W74-07250

FUNCTION OF MARSHES IN REDUCING EUTROPHICATION OF ESTUARIES OF THE MIDDLE ATLANTIC REGION,
Virginia Inst. of Marine Science, Gloucester Point.
D. M. Axelrad, M. E. Bender, and K. A. Moore.
Available from the National Technical Information Service as PB-231 767 $4.00 in paper copy, $1.45 in microfiche. Completion Report, February 1974, 91p, 44 tab. OWRR B-027-VA (1).

Descriptors: *Nitrogen *Phosphorus, *Carbon, Detritus, Budgeting, *Salt marshes, Waterquality, *Eutrophication, *Virginia, Estuaries, Tidal effects, Path of pollutants.
Identifiers: Ware Creek(Va), Carter Creek(Va).

Annual nitrogen, phosphorus and carbon budgets for two Virginia salt marshes were determined by monthly measurements of water discharge and constituent concentrations over tidal cycles. Considering all three forms of phosphorus measured (total, dissolved organic and orthophosphate) there was a net loss from the estuary to the marshes. The data reveal a loss of particulate phosphorus of estuarine origin to marsh sediments and mineralization of this phosphorus in the marshes with subsequent export of dissolved inorganic and organic phosphorus back to the estuary. Nitrogen flux data show a loss of nitrate and nitrite to the marshes. Particulate nitrogen is imported to the marshes where it is mineralized and returned to the estuary as ammonia and dissolved organic nitrogen. The magnitude of nitrogen export suggests significant fixation of atmospheric nitrogen by marsh flora with subsequent export as dissolved species. Carbon flux data show significant contributions of both particulate and dissolved organic carbon to the estuary from the marshes. Estimates of export, based on marsh grass productivity, suggest a loss of 36 and 49% of a years primary production on the marshes as detritus for Ware and Carter Creeks respectively.
W74-07336

SYSTEMS SIMULATION OF THE EFFECT OF TERTIARY TREATMENT FOR CARBON, NITROGEN, AND PHOSPHORUS REMOVAL UPON PRIMARY PRODUCTIVITY, STANDING CROP, AND COMMUNITY STRUCTURE OF AUTOTROPHIC AND HETERTROPHIC COMMUNITIES IN RECEIVING MODEL STREAMS.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., K. L. Dickson, J. Smrchek, P. H. King, and C. W. Randall.
Available from the National Technical Information Service as PB-231 759 $4.25 in paper copy, $1.45 in microfiche. Completion Report, December 1973, 23 p, 2 fig, 13 tab. OWRR B-039-VA (1) 14-31-0001-3660.

Descriptors: *Standing crops, *Biological communities, *Primary productivity, *Nutrients removal, Periphyton, *Eutrophication, *Tertiary Treatment, Simulation analysis, Biomass, Chlorophyll, Nitrogen phosphorus, Carbon, Waste water treatment, Filtration, Coagulation, Activated carbon, Absorption, *Simulation analysis, Water pollution effects.
Identifiers: Systems Simulation, Laboratory models(Streams).

Accelerated eutrophication caused by man continues to be a major water pollution problem. A controllable laboratory system has been designed, composed of several model streams established under comparable environmental conditions. The streams were used in studying the effects, during six experiments, of various conventional tertiary nutrient removal schemes upon the standing crop biomass, phytopigments, primary productivity, and community structure, of autotrophic periphyton communities. Ferric chloride coagulation-precipitation, breakpoint chlorination, and activated carbon absorption with dual media filtration was used for removal of phosphorus, nitrogen, and carbon respectively. All types of tertiary treatment methods studied resulted in varying increases in the above biological parameters. Single nutrient removal methods caused greater increases than double or triple nutrients removal methods. These results indicate that using accepted methods for nutrient removal may not prevent algal productivity resulting in more rapid eutrophication.
W74-07337

EXTRACELLULAR PRODUCTS OF ALGAE IN FRESHWATER,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.
G. E. Fogg.
Ergeb Limnol. 5. p 1-25. 1971.
Identifiers: *Algae, Amino acids, Carbohydrates, Enzymes, Extracellular products, Glycolic acid, Growth, Light, Oligotrophic conditions, *Organic compounds, Peptides, Phosphates, Photosynthesis, Saccharides, Sexual, Toxins, Vitamins, *Reviews, *Carbon compounds.

A review of the available information suggests that the liberation from healthy algal cells of organic substances in soluble form is a general phenomenon. Especially under oligotrophic and light-inhibited conditions a substantial proportion of the C fixed in photosynthesis is liberated extracellularly as glycollic acid or polysaccharides and these probably form an important energy source for other aquatic organisms. Other substances excreted include carbohydrates, amino acids, peptides, organic phosphates, volatile substances, enzymes, vitamins and other growth promoting substances, sexual substances, inhibitors and toxins, many of which may exert important effects in natural ecosystems.--Copyright 1973, Biological Abstracts, Inc.
W74-07353

STUDY OF METABOLISM OF NICKEL ENTERING THE BODY WITH DRINKING WATER, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
N. P. Elakhovskaya.
Gig Sanit. Vol 37, No 6, p 20-22. 1972. (English summary).
Identifiers: Gastro intestinal elimination, *Metabolism, *Nickel, *Potable water, Rodents, Water pollution effects.

Elimination of Ni from the body takes place through the intestinal tract. Retention of the microelement in the organs of rats occurred after introduction of a maximal dose (5 mg/kg). Changes in the functional activity of the gastrointestinal tract did not occur in administration of Ni in a dose of 0.5 mg/kg.--Copyright 1973, Biological Abstracts, Inc.
W74-07361

EFFECT OF EFFLUENTS FROM HYDROLYSIS PLANT ON THE SURVIVAL OF TYPHOID FEVER AND DYSENTERY BACTERIA, (IN RUSSIAN),
Meditsinskii Institut, Irkutsk (USSR).
G. A. Borodina, and L. A. Mironova.
Gig Sanit. Vol 37, No 8, p 101-102. 1972.
Identifiers: *Bacteria(Dysentery), Bactericidal properties, Dysentery, Effluents, Fever, Furfural, *Hydrolysis plants, *Sewage, *Typhoid fever, *USSR(Tulunsk).

Sewage temperature from the Tulunsk plant was 28-40 degrees, pH was 5, biochemical oxygen requirement was 200 mg/1, oxidizing ability 1550

mg/l, and furfural content was 45 mg/l. Microbiological tests showed that the bacteriocidal propreties of sewage were not sufficient regarding Sonne dysentery and typhoid fever bacteria.--Copyright 1973, Biological Abstracts, Inc.
W74-07367

PREDICTING THE QUALITY OF STREAM WATER UNDER CONDITIONS OF OXYGEN DEFICIENCY (O PROGNOZE KACHETVA VODY VODOTOKOV PRI BOL'SHIKH DEFITSITAKH KISLORODA),
For primary bibliographic entry see Field 5B.
W74-07388

MARINE FUNGI ISOLATED FROM A KRAFT PULP MILL OUTFALL AREA,
Simon Fraser Univ., Burnaby (British Columbia). Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W74-07396

A PRELIMINARY DESCRIPTION OF THE PHYSICO-CHEMICAL CHARACTERISTICS AND BIOTA OF THREE STRIP MINE LAKES, SPENCER COUNTY, INDIANA,
Saint Meinrad Coll., Ind. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-07403

ECONOMIC DAMAGES FROM RESIDENTIAL USE OF MINERALIZED WATER SUPPLY,
Environmental Protection Agency, Washington, D.C. Economic Analysis Div.
D. P. Tihansky.
Water Resources Research, Vol 10, No 2, p 145-154, April 1974. 8 fig, 5 tab, 38 ref.

Descriptors: *Water quality, *Domestic water, *Damages, Public health, Scaling, Corrosion, Economics, Abrasion, *Costs, Plumbing, *Computer programs, Clogging.

Household appliances and personal items in contact with water supplied municipally or from private sources are subject to physical damages from chemical and other constituents of the water. Economic losses are calculated for a typical household and aggregated to the national and individual state levels. The types of physical damages expected and the associated water quality determinants were identified, and the physical effects were then translated into economic losses. Damage functions were formulated to predict likely impacts of water quality changes on each household unit affected. A computer program based on these functions was designed to estimate total damages per typical household and to aggregate them over selected regions. The program was applied to state-bystate data describing water supply sources and socioeconomic parameters. Total annual damages to U.S. residents in 1970 were estimated to be in the range $0.65-$3.45 billion, the mean being $1.75 billion. The mean translates to $8.60 per person annually. States having the highest total damages were California ($230 million) and Illinois ($164 million). On a per capita basis, Arizona ($22.53) and New Mexico ($18.58) ranked highest, whereas South Carolina ($1.15) and Oregon ($1.73) were at the other end of the spectrum. When per capita damages were compared by source of water supply, private wells were highest at an average of $12.34, treated groundwater was next at $11.20, and treated surface water was last at $5.83. (Knapp-USGS)
W74-07417

VOLCANIC AIR POLLUTION: DELETERIOUS EFFECTS ON TOMATOES,
Hawaii Agricultural Experiment Station, Honolulu.
B. A. Kratky, E. T. Fukunaga, J. W. Hylin, and R. T. Nakano.
Journal of Environmental Quality, Vol 3, No 2, p 138-140, April-June 1974. 2 fig, 3 tab, 6 ref.

Descriptors: *Air pollution, Volcanoes, *Hawaii, *Air pollution effects, *Tomatoes, Hydrogen ion concentration, Chlorides, Sulfates, Rainfall, Morbidity, Phytotoxicity.
Identifiers: *Volcanic air pollution.

From the winter of 1969-70 to the summer of 1973, severe yield and quality reductions related to volcano eruptions occurred on field grown tomatoes in the Kona district on the Island of Hawaii. Symptoms included blossom drop, poor fruit set, hollow, small, and almost seedless fruits, and a less luxuriant appearance. A definite atmospheric haze was caused by fumes from active and degassing vents located 75 km away and associated with Kilauea Volcano. Tomato plants under plastic rainshelters grew normally. Rainwater was acidic (pH 4.0) and contained appreciable quantities of Cl and SO4 plus 27 detectable organic compounds. When tomato leaf discs were immersed in rainwater samples, more Ca, Mg, and K were leached from these acidic samples then from less acidic rainwater samples and the distilled water controls. In a pollen germination medium containing rainwater, pollen germination and tube lenghts decreased as the pH of the rainwater decreased. The rainwater samples from a single heavy rainfall were less acidic than from cumulative samples of lighter rainfalls. (Knapp-USGS)
W74-07430

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART B),
Notre Dame Univ., Ind. Dept. of Biology.
R. W. Greene.
Available from the National Technical Information Service as COO-1770-4; $5.25 in paper copy, $1.45 in microfiche. Report COO-1770-4, March 1973. 62 p, 2 fig, 24 tab, 39 ref. AEC AT (11-1)-1770.

Descriptors: *Cycling nutrients, *Productivity, *Dystrophy, *Bogs, Baseline studies, Phosphorus, Cations, Ions, Metabolism, Calcium, Lime, Iron, Organic matter, Predation, Midges, Zooplankton, Mosses, Food webs, Alkalinity, *Indiana.
Identifiers: *Lake-bog systems, Chaoborus americanus, Sphagnum.

Baseline data were collected on several different bog-lakes. Total phosphate determinations were done on material trapped in the sediment collectors placed throughout the water column. It was suggested that if the bog lakes were permanently meromictic, then perhaps all vertical transport (especially through the monimolimnion) is by biological transport. In general, alkalinity is increased throughout the water column following liming, and slowly drops back to normal values in a matter of weeks. To gain some insight into iron cycling and abundance at various depths, total iron analyses were done on material caught in sediment traps throughout the water column. It was found that both calcium and iron were bound to the large-molecule organic fraction, but differed in extent. The predatory potential of the Chaoborus populations is a function of two behavioral responses: the functional response of individual predators and the numerical response of the predator populations. Any input of alkaline earth cations into one bog studied will rapidly be sequestered by Sphagnum of the bog mat. As a result the main cause of increased productivity due to artificial alkalinization is the chemical effect which increases the buffering capacity and therefore the available carbon in the system. (Jones-Wisconsin)
W74-07466

SEASONAL ABUNDANCE AND VERTICAL DISTRIBUTION OF CRUSTACEAN ZOOPLANKTON IN A COLOURED DYSTROPHIC LAKE IN NORTHEASTERN ONTARIO,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Environmental Research Branch.
J. W. McMahon.
Available from the National Technical Information Service as AECL 4312; $1.00 in paper copy, $1.45 in microfiche. Atomic Energy of Canada, Ltd., Report AECL-4312, January 1973. 26 p, 12 fig, 1 tab, 22 ref.

Descriptors: *Distribution, *Crustaceans, *Zooplankton, Dystrophy, *Canada, Copepods, Daphnia, Seasonal, Spatial distribution, Temporal distribution, Dominant organisms.
Identifiers: Diaptomus reighardi, Cyclops bicuspidatus, Bosmina coregoni, Daphnia catawba, Upper Bass Lake(Ontario), Chalk River(Ontario).

Information is provided on abundance and species numbers of net zooplankton present in one of the numerous colored-water lakes lying within the eastern limits of the Precambrian Shield. Weekly plankton samples were collected at 10 stations in upper Bass Lake, Ontario. Twelve species of crustacean plankton were identified, consisting of seven copepods and five cladocerans. Maximum observed abundance, seasonal and vertical distribution were also noted. Histograms show vertical distribution and weekly abundance of the different species. The calanoid copepod Diaptomus reighardi, the most abundant crustacean was found in the plankton throughout the year. Several species of Cladocera were present, Bosmina coregoni and Daphnia catawba being the second and third most dominant crustacea in the zooplankton community. Four dominants were noted consisting of Diaptomus reighardi (29.5%), Cyclops bicuspidatus (15.2%), Daphnia catawba (19.2%) and Bosmina coregoni (22.4%). Tropocyclops prasinus, while not dominant, accounted for 5% of the total crustacean population. The ratio of total Copepoda to total Cladocera for each of the three years remained constant with the copepods accounting for approximately 60% of the zooplankton. (Jones-Wisconsin)
W74-07467

SOME ASPECTS OF THE TEMPERATURE, OXYGEN AND NUTRIENT DISTRIBUTIONS IN MONTEREY BAY, CALIFORNIA. ANNUAL REPORT, PART 1, 1973,
Moss Landing Marine Labs., Calif.
W. M. Smethie, Jr.
Available from the National Technical Information Service as COM-73-11648; $4.25 in paper copy, $1.45 in microfiche. Technical Publication 73-1, 1973. 97 p, 29 fig, 12 tab, 41 ref, 2 append. NOAA SGP2-94.

Descriptors: *Bays, *Temperature, *Dissolved oxygen, *Nutrients, *Distribution, *California, Water circulation, Upwelling, Tides, Photosynthesis, Nitrates, Phosphates, Ammonia, Outfall sewers, Tidal effects, Seasonal, Oceanography, Physical properties, Chemical properties, Dispersion.
Identifiers: *Monterey Bay(Calif.), Flushing.

Seasonal changes, seasonal cycles, upwelling, general water movement, nutrient-oxygen relations and salinity were surveyed in Monterey Bay. Three oceanographic periods occur in the bay: The Davidson Current period November to February, upwelling period February to September, and oceanic period from September to November. Seasonal variations were similar for the canyon area of the bay and nearshore areas. Over the head of Monterey Submarine Canyon, daily variations of physical and chemical parameters can be as large as seasonal variations. Upwelling apparently occurred in the submarine canyon during all months except perhaps March and April 1972. The average ratio of delta apparent oxygen utilization: delta nitrate: delta phosphate was 279:14:1 by atoms of O, N, and P and is in good agreement

with the expected O:N:P ratio of 276:16:1. Rates of carbon fixation were estimated from phosphate uptake, nitrate uptake, and oxygen production rates. Nitrate was observed to be the limiting nutrient. Residence time of water during upwelling was estimated to average 3 to 8 days in the northern and southern ends of the bay. Ammonia concentrations were highly variable with time and showed no seasonal trend. (Jones-Wisconsin)
W74-07469

NUTRITIVE IMPORTANCE AND STRUCTURE OF DETRITUS,
A. G. Rodina.
Available from the National Technical Information Service as NRC TT1625, $3.00 in paper copy, $1.45 in microfiche. National Research Council of Canada, Ottawa, Technical Translation 1625, 1972. 11 p, 4 fig, 35 ref. Translated from Biologicheskie Resursy Vodoemov. Puti ikh Rekonstruktsii i Ispol'zovaniya Izdatel'stvo 'Nauka, Moscow 1966, p 35-42.

Descriptors: *Nutrients, *Detritus, *Benthic fauna, Productivity, Bacteria, Microorganisms, Proteins, Vitamins.
Identifiers: *Structure of detritus.

The common characteristic of detritus is its heterogeneity. The sources, components, and nutritional value of detritus in various waters are discussed. The development of fluorescent techniques makes it possible to investigate its structure. Detritus consists of a complex conglomeration of organic substances serving as substrate for development of an immendsely rich microorganism population. Every minute particle is saturated with bacteria and contains live microalgae, various protozoans, and rotifers; a detrital particle is a seat of high bacteriological activity at the water-particle interface. The structure of detritus is closely related to the nature of the water body, the development of life in it, and the time of year. Rivers carry mostly detritus digested by bacteria, broken up into minute particles by water, and containing large quantities of live microscopic algae. The absorption of dissolved and colloidal material by organic and inorganic particles is of great importance in the alteration of detritus and for the development of microorganisms in it. Different origins of detritus and predominance of either plant or animal remains determine the development of its bacterial processes, which, in turn, determines its pH. Detritus is a source of proteins, vitamins, and other biostimulants in the nutrition of aquatic animals. (Jones-Wisconsin)
W74-07471

FIELD AND EXPERIMENTAL STUDIES ON THE SYSTEMATICS AND ECOLOGY OF ULVA CURVATA AND ULVA ROTUNDATA,
North Carolina Univ., Chapel Hill. Dept. of Botany.
C. F. Rhyne.
Available from the National Technical Information Service as COM-73-10783, $3.00 in paper copy, $1.45 in microfiche. University of North Carolina, Sea Grant Publication UNC-SG-73-09, March 1973. 123 p, 26 fig, 5 tab, 167 ref.

Descriptors: *Marine algae, *Systematics, *Estuaries, Life history studies, *Bioindicators, Salt marshes, Eutrophication, Cytological studies, Water pollution effects, Biorhythms, Ecology, *North Carolina.
Identifiers: *Ulva curvata, *Ulva rotundata, Eastern U.S. coasts, Calico Creek(N.C.).

With its sessile habit, simple morphology and handling ease in culture, Ulva and similar macrobenthic algae may be especially useful as indicators of nutrient pollution in eutrophication of marine and estuarine environments. To understand their taxonomy and ecology, Ulva curvata (marsh-like habitats) and Ulva rotundata (more saline habitats) were studied. To establish distribution of U. curvata, mating studies were carried out with plants from the principal research site in Calico Creek, North Carolina and material from Georgia and New Jersey. Male and female gametes released from thalli obtained at each locality mated with gametes from Calico Creek material and produced viable zygotes which germinated normally. Life cycle of U. curvata was demonstrated in field and laboratory studies to involve an alternation of isomorphic gametophyte and sporophyte generations. While all nuclear phases and growth forms appear to be connected to one another by meiosis and syngamy, somatic diploidization of female plants leading to parthenosphorophytes is frequent. Germination, early development, thallus growth, reproduction and senescence were investigated under laboratory conditions to account for life history and ecological adaptations of U. curvata observed in the field. These studies demonstrate that Ulva can serve as important indicators of eutrophication. (Jones-Wisconsin)
W74-07473

AN INVESTIGATION OF THE PHYSICAL IMPACT OF SEWAGE OUTFLOW ON A RIVER-ESTUARINE ENVIRONMENT,
Naval Academy, Annapolis, Md.
D. D. Wagner.
Available from the National Technical Information Service as AD-769 514, $3.50 in paper copy, $1.45 in microfiche. A Trident Scholar Project Report No 50, May 1973. 69 p, 9 fig, 5 tab, 30 ref, 3 append.

Descriptors: *Mathematical models, *Waste dilution, *Estuaries, *Rivers, Dispersion, Physical properties, *Maryland, Currents(Water), Outfall sewers, Tidal effects, *Chesapeake Bay, Nutrients, Computer programs, Density stratification, Salinity, Convection.
Identifiers: Eastport(Md.), Severn River(Md.), River-estuarine environment.

The possible physical impact of sewage discharges into the Severn River from the treatment plant located in Eastport, Maryland is described. Problems result because the system does not behave entirely in either a riverine or esturine manner. Using the classification of a river-estuarine environment, which incorporates characteristics of both rivers and estuaries, allows design of a numerical flushing model that predicts excess sewage concentrations in the river-estuary. Several runs were conducted with the model to determine the impact of the sewage. A buoyant plume model of the behavior of the sewage upon introduction to the receiving water indicates dilution to a 3% sewage concentration by the time the waste reaches the surface. Bottom currents were investigated and compared with surface flows to assess their effect on dispersion of the contaminants. Finally, a tidal flushing model was constructed that predicts a uniform sewage pollution excess over the conditions of the Chesapeake Bay of approximately .05% throughout the Severn. Effects of various environmental changes are discussed as predicted by modification of the numerical model. Under present circumstances, no detrimental physical impact on the environment was shown to exist. (Jones-Wisconsin)
W74-07477

THE PLANKTON OF PONDS ENRICHED WITH WASTES FROM BEET SUGAR FACTORIES,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
K. Kyselowa.
Acta Hydrobiologica, Vol 15, No 1, p 51-88, 1973. 7 fig, 5 tab, 60 ref.

Descriptors: *Sewage lagoons, *Plankton, Sugar beets, *Food processing industry, Phytoplankton, Zooplankton, Self-purification, Chlamydomonas, Euglena, Euglenophyta, Biochemical oxygen demand, Wastes, Stagnant water, Rotifers, Crustaceans, Cyanophyta, Biomass, Eutrophication, Succession, Systematics, Waste treatment.
Identifiers: *Sugar beet processing wastes, *Poland.

The effect of sugar factory effluents on waste ponds in Poland was investigated by characterization of phyto- and zooplankton populations. Phytoplankton was represented by 293 systematic units, consisting of 241 species with varieties and forms. Certain taxons were determined from the Cyanophyceae, Euglenophyceae, Cryptophyceae, Flagellata apochromatica, Volvocales, Chlorococcales and Conjugales. In the zooplankton 63 species and 33 higher systematic units were determined. The succession of individual groups of plankton followed in four stages whose length was affected by the concentration of wastes. Stage I (heterotrophy) showed the beginning of development of Volvocales and Euglenophyceae and an almost total lack of zooplankton. It was a period of high biochemical and chemical oxygen demand and of oxygen deficit. Stage II (hyperautotrophy) was characterized by the appearance of Chlorococcales and Cryptophyceae with growing numbers of zooplankton (mainly rotifers). It was correlated with a further decrease in biochemical and chemical oxygen demand and with a high oxygen content. In the IIId (transition stage), a decrease in algal numbers and an increase in Cladocera were observed. Stage IV was characterized by stabilization of the chemical conditions and by the formation of phyto- and zooplankton communities characteristic of normally utilized ponds. (Jones-Wisconsin)
W74-07478

DISEASES OF POND FISHES,
For primary bibliographic entry see Field 8I.
W74-07481

A STUDY OF THE MOVEMENT OF PHOSPHOROUS IN THE LITTLE RIVER ESTUARY, N.S.W.,
Australian Atomic Energy Commission Research Establishment, Lucas Heights.
For primary bibliographic entry see Field 5B.
W74-07483

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
P. E. Chase, and V. E. Smith.
Available from the National Technical Information Service as N-73-18331, $5.50 in paper copy, $1.45 in microfiche. Report No BSR 4010, February 1973. 70 p, 35 fig, 2 tab, 40 ref, NAS 521810.

Descriptors: *Satellites(Artificial), *Remote sensing, *Eutrophication, Classification, Lakes, Algae, Detritus, Monitoring, Color, Water quality, Trophic level, *Michigan, Baseline studies, Data transmission, Computers, Spectrophotometry, Technology.
Identifiers: *ERTS-1, Computer compatible tapes, Imagery interpretation, Spectral bands, Oakland County(Mich.).

Preparation phase accomplishments and accomplishments during the initial review of Earth Resources Technology Satellite (ERTS-1) are described. The capability of ERTS-1 to resolve different sizes and shapes of lakes in each MSS band is necessary to correlate ERTS-1 data to lake water color. Water quality data collected over the past three years have been tabulated and compared for the purpose of classifying four Michigan lakes as to relative trophic level. Although all four are mildly to moderately eutrophic, they can be arranged in a series of increasing enrichment. Further study of these lakes is being carried out by the Cranbrook Institute of Science. The 'baseline'

data on water quality have been considered carefully in setting up the water analysis procedures for concurrent ERTS and ground monitoring of lakes. Any such monitoring program must be a compromise between expediency and data yield, since full coverage of all the lakes within two hours of the ERTS overflights is highly desirable. When computer compatible tapes are available, the image density patterns on selected lakes can be compared to their bathymetry and to low altitude imagery to determine whether variations in water color are recorded by ERTS. (Jones-Wisconsin)
W74-07484

AN INVESTIGATION OF PROPAGATION AND THE MINERAL NUTRITION OF SPARTINA ALTERNIFLORA,
North Carolina State Univ., Raleigh. Dept. of Soil Science.
S. W. Broome, W. W. Woodhouse, Jr., and E. D. Seneca.
Available from the National Technical Information Service as COM-73-11290, $4.50 in paper copy, $1.45 in microfiche. University of North Carolina Sea Grant Publication UNC-SG-73-14, 1973. 121 p, 18 fig, 49 tab, 46 ref.

Descriptors: *Seeds, *Grasses, *Germination, *Plant growth, *North Carolina, Nutrients, Soil properties, Salinity, Mathematical models, Salt marshes, Estuaries, Nitrogen, Phosphorus, Potassium, Iron, Bank stabilization, Storage.
Identifiers: *Spartina alterniflora, Propagation, Salt marsh cord grass.

Spartina alterniflora is the dominant plant of intertidal zone of bays and estuaries along nearly all the east coast of North America. Effect of seed sources and storage treatments on viability of its seed and seed plant performance in North Carolina estuaries is reported. Under favorable conditions, S. alterniflora produces large quantities of viable seed. Seed should be collected from vigorous stands and stored overwinter submerged in estuarine or sea water at temperatures around 2-3C. Field experiments have shown that direct seeding can be effective in establishing new stands on dredge spoil material. Results indicate tissue concentrations of several nutrients and several soil properties are significantly associated with variations in yield and height of S. alterniflora. The importance of Mn and S in both the yield and height equations and Fe in the height equation suggest investigation into influence of chemical effects of waterlogging of the marsh soil. Increased growth of S. alterniflora in response to applications of fertilizer indicates that the productivity of some salt marshes is limited by nutrient supplies. Nitrogen and P fertilizers were shown to enhance growth of seedlings and transplants artificially established on dredge spoil. (Jones-Wisconsin)
W74-07486

STUDIES ON ORGANISMS FOUND IN ARCTIC SEA ICE,
Alaska Univ., College. Inst. of Marine Science.
R. A. Horner.
Available from the National Technical Information Service as AD-768 399, $4.75 in paper copy, $1.45 in microfiche. Final Report to Arctic Institute of North America, Washington, D.C., March 1973. 150 p, 9 fig, 3 tab, 31 ref, append. NR 307-105. N00014-70-A-0219-0001.

Descriptors: *Aquatic microorganisms, *Arctic, *Ice, Nutrients, Salinity, Chlorophyll, Kelps, Diatoms, Dinoflagellates, *Alaska, Sea water, Algae, Zooplankton, Systematics, Invertebrates.
Identifiers: Flagellates, Ciliates, *Barrow(Alaska).

Studies of ice organisms near Barrow, Alaska showed that the shore-fast ice is a habitat for a relatively complex assemblage including diatoms, pigmented and non-pigmented dinoflagellates and flagellates, and ciliates. Samples were collected, field measurements made and laboratory studies performed. Species from each station in five locations were investigated and are listed. The deep-water stations were sampled to see if the spring phytoplankton bloom was occurring in the seawater under the ice and to try to determine the areal extent of the organism layer in the bottom few centimeters of ice. The sampling technique had possed a problem as pieces of ice would break from the core and be lost. When ice cores are brought to the surface, cells are exposed to extremes of temperature and light whose effect is not known. Melting the ice at room temperature may also affect the cells. Small flagellates seem to be the most abundant organisms found in new ice in the fall. Perhaps many of the ice organisms, especially the diatoms, are benthic species which may be brought into the water column during the fall storms and remain long enough to become trapped as the ice forms. A recently discovered kelp bed is described. (Jones-Wisconsin)
W74-07487

POSSIBLE EFFECTS OF CONSTRUCTION AND OPERATION OF A SUPERTANKER TERMINAL ON THE MARINE ENVIRONMENT IN NEW YORK BIGHT,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
J. L. McHugh, J. J. Ginter, W. E. Knapp, A. L. Tsao, and M. D. Greenfield.
Available from the National Technical Information Service as PB-219 649, $3.00 in paper copy, $1.45 in microfiche. Final Report to Council on Environmental Quality, Washington, D.C. November 15, 1972. 213 p, 55 fig, 17 tab, 119 ref.

Descriptors: *Environmental effects, *Offshore platforms, *Harbors, *Projections, *Water pollution sources, New York, Dredging, Structures, Disposal, Oil spills, Ships, Coasts, Oil industry, Construction, Import, Pipelines, Biota, Connecticut, New Jersey, Economic justification, Value, Geology, Physical properties, Chemical properties.
Identifiers: *New York Bight, *Supertanker terminals, Offshore ports, Sandy Hook Bay(Conn.), Raritan Bay(N.J.).

Environmental effects of construction and operation of supertanker terminals are assessed by evaluating specific sites in the New York Bight. Information was obtained entirely from the existing literature and from discussions and correspondence. Oil and oil products made up at least one quarter of the cargoes transported by marine traffic. Physiography, geology, physical aspects, chemical aspects, and marine resources of New York Bight are presented. Adverse construction effects on the environment and biota will be much less at offshore sites than in Sandy Hook Bay. Sites in the New York Bight area are ranked on the basis of the effects of construction alone and in descending order to preference: Castle Hill, Tobay Beach, and Sandy Hook Bay. The effects and possible effects of dredging on the marine environment are described. In regard to Raritan Bay, a major supertanker terminal is not consistent with plans for pollution abatement. Environmental effects of supertanker terminal operation appear to be related primarily to chronic oil leakage or accidental spills. The Tobay Beach site, farther offshore and in deeper water than the Castle Hill site, may be less desirable because it might interfere with commercial clamming and fishing operations. (Jones-Wisconsin)
W74-07488

KELP HABITAT IMPROVEMENT PROJECT, ANNUAL REPORT JULY 1, 1970 - JUNE 30, 1971.
California Institute of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
Available from the National Technical Information Service as COM-73-10861, $4.50 in paper copy, $1.45 in microfiche. (1971). 159 p, 49 fig, 22 tab, 41 ref. Sea Grant GH-92.

Descriptors: *Resources development, *Kelps, *Habitats, Life history studies, Animal parasites, Animal diseases, Epizootiology, Marine animals, Nutrients, Amino acids, Reproduction, Pest control, Grazing, *California, Phaeophyta, Limiting factors, Cultures, Planting management, Control.
Identifiers: *Kelp beds improvement, *Macrocystis, *Sea urchins control, Lytechinus.

Kelp beds are believed to contribute significantly to coastal biology and the kelp community is an important marine resource. About 1940, persistent deteriroation began of certain kelp beds off the southern California coast. By 1960, a number of significant kelp areas had dwindled to scattered patches or entirely disappeared. It was concluded that in addition to the recent damage caused by a period of warm water, hordes of grazing sea urchins were destroying large quantities of kelp and preventing normal reforestation. Loss of an important natural urchin predator, the sea otter, may have contributed to the situation. It was possible to restore more than half of a deteriorated kelp area off Point Loma solely by urchin control measures. During 1970-71, dispersion of kelp embryos was first attempted on a large scale. Final phases of a research project on nutrition of sea urchins are reported. A facility for mass-culturing Macrocystis (kelp) embryos went into operation December 1970. Studies were made on sea urchins including commensals and parasites, internal conditions, juveniles and larval urchins, and urchin diseases. Autoradiographic analysis confirmed previous finds that urchins can remove dissolved amino acids from sea water in low concentrations. (Jones-Wisconsin)
W74-07489

KELP HABITAT IMPROVEMENT PROJECT, ANNUAL REPORT JULY 1, 1971 - JUNE 30, 1972.
California Institute of Tech., Pasadena. W. M. Keck Lab. of Environmental Health Engineering.
Available from the National Technical Information Service as COM-73-10862, $4.75 in paper copy, $1.45 in microfiche. (1972). 200 p, 57 fig, 18 tab, 14 ref. Sea Grant GH-92.

Descriptors: *Resources development, *Kelps, *Habitats, *California, Marine animals, Marine algae, Grazing, Life history studies, Nutrient requirements, Competition, Limiting factors, Cultures, Reproduction, Pest control, Planting management, Control, Methodology.
Identifiers: *Kelp beds improvement, *Macrocystis, Sea urchin control.

Rehabilitation of the deteriorating kelp beds off the southern California coast is discussed. Persistent deterioration of Macrocystis began about 1940 due to an interval of warm temperatures followed by grazing of vast numbers of sea urchins who were destroying the remains of several important kelp beds. Preliminary experimentation revealed that dispersal of embryonic Marcrocystis sporophytes yielded modest numbers of juvenile plants. A kelp-culturing facility was constructed in 1970 and began producing large scale cultures in 1971. Kelp restoration activities in San Diego, Orange, and Los Angeles Counties are reported. Grazer control operations were carried on at Abalone Cove. Dispersals of cultured kelp embryos indicated that pretreatment of the bottom with quicklime enhanced ability of tiny plants to become established. Significant kelp beds appeared between Corona del Mar and Pelican Point during 1971-72. Large numbers of juvenile plants were recorded off Corona del Mar. Times of appearance and distribution of the small plants correlated well with times and sites of the kelp embryo dispersal operations. A preliminary model of relations between grazing fishes and kelp resources was developed. Techniques for emplanting PVC rings bearing cultures of tiny kelp plants onto the sea floor were developed. (Jones-Wisconsin)
W74-07490

PROCEEDINGS 2ND ANNUAL TECHNICAL CONFERENCE ON ESTUARIES OF THE PACIFIC NORTHWEST.
For primary bibliographic entry see Field 2L.
W74-07491

A STRATEGY FOR MODELING PRIMARY PRODUCTION IN STRATIFIED FJORDS,
Washington Univ., Seattle. Dept. of Oceanography.
D. F. Winter, and K. Banse.
In: Proceedings 2nd Annual Technical Conference on Estuaries on the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 30-41 (1972). 9 fig, 1 tab, 21 ref.

Descriptors: *Mathematical models, *Primary productivity, *Fjords, Pacific coast region, Zooplankton, Phytoplankton, Inlets(Waterways), Estuaries, Mixing, Hydrodynamics, Eutrophication, *Washington, Circulation, Hydrography.
Identifiers: *Puget Sound(Wash).

Most numerical phytoplankton models are based on a conservation equation that attributes algal biomass variations to photosynthetic respiratory activity, sinking of cells, herbivore grazing, and to mixing and advection in the medium. In some inlets, or segments thereof, certain numerical tasks can be obviated by using approximate expressions for hydrodynamic variables derived by using similarity techniques. This procedure is described. The general approach is illustrated with a model of springtime phytoplankton blooms in the main basin of Puget Sound in the spring 1966. Those features of inlet flow which are relevant to the problem are reviewed. To avoid incapacitating complexity, attention is confined to primary production in a steep-sided, relatively straight fjord segment. From modeling experiments with data from zooplankton hauls, the conclusion is that grazing pressure by herbivores probably does not reduce the chlorophyll density in Puget Sound by more than 10% to 20% during blooms. Although conclusions are still tentative, a reasonable, self-consistent picture of phytoplankton ecology in deep inlets is emerging. It is believed that the modeling strategy described will enable specification with some confidence of environmental factors which control algal blooms in Puget Sound system and elsewhere. (See also W74-07491) (Jones-Wisconsin)
W74-07494

AN ECOSYSTEM STUDY IN THE INSIDE PASSAGE OF SOUTHEASTERN ALASKA,
Oregon State Univ., Corvallis. Dept. of Oceanography.
H. C. Curl.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 42-49 (1972). 5 fig, 1 tab, 10 ref.

Descriptors: *Bays, *Alaska, *Productivity, Estuaries, Nutrients, Plankton, Enzymes, Zooplankton, Nitrogen, Amino acids, Nitrates, Ammonia, Eutrophication, Phytoplankton, Light intensity, Model studies, Mixing.
Identifiers: *Auke Bay(Alaska), Alaska Inside Passage.

In Auke Bay near Juneau and the Alaskan Inside Passage there is a strong, two-layered circulation in summer, upwelling is frequent, seasonal cycles are similar from year to year, zooplankton usually occur as a single, mid-summer pulse, and most chemical and biological properties, except zooplankton, are homogeneously distributed in the horizontal plane. A study was made of the differences in the activity of the enzyme nitrate reductase between Thalassiosira and Skeletonema. Effect of light intensity on nitrate assimilation and nitrate supported growth of the two organisms was studied. The sequence of events is now thought to be that the initial spring bloom is initiated by the onset of stability, increasing solar radiation, and high levels of initial nutrients. Species composition at this time is controlled by temperature acting on enzymatic processes and by nutrient availability. Subsequent blooms and their composition are controlled by periodic wind mixing, replenishing nutrients from beneath the pycnocline, in situ nutrient regenerations by grazing zooplankton, or possibly, directly from phytoplankton, advection and stream flow, rainfall, and grazing by zooplankton. The biological response varies according to the interactions of the forcing functions. (See also W74-07491) (Jones-Wisconsin)
W74-07495

THE ENVIRONMENTAL IMPACT OF CADMIUM,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5A.
W74-07530

EVALUATION OF METHODS OF PUMPING TEST ANALYSES FOR APPLICATION TO HAWAIIAN AQUIFERS,
Hawaii Univ., Honolulu. Water Resources Research Center.
J. A. Williams, and R. L. Soroos.
Technical Report No 70, July 1973. 159 p, 64 fig, 46 tab, 74 ref, append.

Descriptors: *Aquifers, Analytical methods, Drawdown, *Pumping, Transmissivity, Hydraulic conductivity, Anisotropy, Geology, *Hawaii, Logging(Recording), *Aquifer testing, *Well data, *Methodology, Storage.

Pumping test data from eight locations including the islands of Oahu, Maui, and Molokai were selected and analysed. The test data were selected on the basis of completeness, reliability, and aquifer type and boundary conditions involved. Analyses included the standard Theis, Thiem, and Jacobs methods as well as those techniques which deal with boundaries (Stallman method), partial penetration of the well (Hantush-Theis method), leaky aquifers (Walton method), and anisotropy (Hantush method for anisotropic aquifers). In addition, the Zanger method for partially penetrating wells and equilibrium data was also used. Results of the several different analyses were compared and recommendations made as to which method or combination of methods seemed best suited for Hawaii aquifers. In the case of the principal basal aquifer, the Hantush-Theis method for non-equilibrium data or the Zanger method for equilibrium data are recommended. In the event that leakage or boundaries are a factor, the former method used with early-time data is recommended.
W74-07531

AN EPIDEMIOLOGICAL STUDY ON CLONORCHIS SINENSIS AT THE NORTHERN PART OF WAKAYAMA PREFECTURE, MIDDLE JAPAN, (IN JAPAN),
Kyoto Prefectural Univ. of Medicine (Japan). Dept. of Medical Zoology.
Misao, Nagahana, Yukio Yoshida, Kikuo Matsuo, Horohito Sugihara, and Kaoru Kondo.
Jap J Parasitol. Vol 21, No 2, p 96-100, 1972, Illus. (English summary).
Identifiers: *Clonorchis-Sinensis, *Epidemiological studies, Gnathopogon-Elongatus-Elongatus, *Japan(Wakayama), Parafossarulus-Manchouricus, Pseudorasbora-Parva.

An epidemiological study on C. sinensis was carried out at the northern part of Wakayama Prefecture, middle Japan during the period from 1964-1970. The first intermediate host snail, Parafossarulus manchouricus, was detected from 9 ponds and 1 river out of 62 stations examined. Two kinds of freshwater fishes (154 in total number), Gnathopogon elongatus elongatus and Pseudorasbora parva, were collected from the ponds where the snail host was abundantly found. In 34 out of 136 former fish and in 4 out of 18 latter fish the metacercaria of C. sinensis was infected. The minimum number of the metacercaria per fish was 1, and the maximum was 32. In order to clarify the human infection with this fluke, 286 fecal specimens were collected from farm villages located close to the ponds where the intermediate hosts were found. As the result, C. sinensis eggs were detected in 5 persons (1.8%).--Copyright 1973, Biological Abstracts, Inc.
W74-07540

POPULATION DYNAMICS OF PROTOZOA ASSOCIATED WITH THE DECAY OF ORGANIC MATERIALS IN FRESH WATER,
Bonn Univ. (West Germany). Institut fuer Landwirtschaftliche Zoologie und Bienenkunde.
H. Bick.
Am Zool. Vol 13, No 1, p 149-160. 1973, Illus.
Identifiers: *Decaying organic matter, *Population dynamics, *Protozoa(Ciliates), Water pollution effects.

The high intensity of decomposition in heavily polluted systems favors high individual counts of certain species of ciliate Protozoa, in spite of the lack of dissolved oxygen and the presence of ammonia and other products of septic decay. Other species grow best under the particular concitions of starting re-aeration or nitrification, respectively. In general, the whole range of the self-purification process may be divided into zones which are characterized by particular associations of ciliates. The population growth of these species is regulated by: availability of food, for example, bacteria; abiotic environmental factors, such as oxygen and products of septic decay; and competition and predatory-prey relations.--Copyright 1973, Biological Abstracts, Inc.
W74-07541

LEECH COMMUNITIES (HIRUDINEA) IN THE MAZURIAN AND BIALYSTOK REGIONS AND THE POMERANIAN LAKE DISTRICT,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
H. Sandner, and J. Wilkialis.
Ekol Pol. Vol 20, No 27, p 345-365. 1972.
Identifiers: *Eutrophic lakes, Lakes, *Leeches(Hirudinea), *Poland(Pomeranian), Water pollution effects.

Studies were made of the occurrence of leeches (Hirundnea) in eutrophic lakes in the Mazurian and Bialystok regions and in the Pomeranian Lake District (Poland) on working stations situated in and outside bays, either sheltered behind a belt of vegetation or open from the lake side, and also in shallow and warm waters and in highly eutrophic lakes. Results are given.--Copyright 1973, Biological Abstracts, Inc.
W74-07542

EFFECTS OF THICKNESS ON BACTERIAL FILM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
R. C. Hoehn, and A. D. Ray.
Journal Water Pollution Control Federation, Vol 45, No 11, p 2302-2320, November 1973. 21 fig, 1 tab, 18 ref.

Descriptors: *Nutrients, *Absorption, Cultures, Organic matter, Metabolism, Chemical oxygen demand, Pseudomonas, *Slime, Films, Oxygen, Growth rates.
Identifiers: *Bacterial films, *Substrate utilization, Thickness, Oxygen diffusion, Film density, Flavobacterium, Bacillus, Micrococcus, Microbacterium, *Glucose.

An investigation was initiated to determine the effects of thickness on the nutrient utilization capacity of bacterial films, that is, whether that rate remains constant or decreases as the film depth increases. Bacterial films were developed in laboratory-scale rotating cylinders. Lyophilized seed and cultures maintained on agar were used to inoculate a drum at the beginning of any particular culturing operation. The isolates were identified as belonging to the genera Bacillus, Micrococcus, Pseudomonas, Flavobaterium, and Microbacterium. Ten sections of each cylinder could be removed so that film thickness could be measured periodically. A shallow stream of synthetic media flowed continuously through the cylinders during the culturing operations, and the differences in influent and effluent concentrations of organic matter were used to calculate nutrient uptake rates. These rates were examined as functions of thickness. In one series of studies, film solids were measured and examined as functions of thickness. Nutrient uptake rates attained a maximum at thickness between 100 and 150 microns and, if all data were composited, appeared to stabilize. When data from individual experiments were examined separately, however, nutrient utilization began decreasing between 100 and 150 microns, continuing until the films were approximately 400 microns thick. Beyond that thickness, the rates increased again to their former levels. (Mortland-Battelle)
W74-07545

HYDROGEN SULFIDE PRODUCTION BY SYNECHOCOCCUS LIVIDUS Y52-SI,
Montana Univ., Missoula. Dept. of Botany.
R. P. Sheridan.
Journal of Phycology, Vol 9, No 4, p 437-445, December 1973. 7 fig, 5 tab, 30 ref.

Descriptors: *Anaerobic conditions, *Cyanophyta, *Hydrogen sulfide, *Water pollution sources, Plant growth, Aquatic algae, Sulfates, Plant physiology, Chemical reactions, Inhibition, Chemical analysis, Cultures, Organic compounds.
Identifiers: *Algal physiology, *Synechococcus lividus, *Photoproduction, Thermophilic algae, Photochemistry, Substrate utilization, Biosynthesis, Thiosulfates, Plant metabolism, 3-(3 4-Dichlorophenyl)-1 1-dimethyl urea, Monofluoroacetic acid, Photoreduction, Carbonyl m-chlorophenyl-hydrazone, Quantitative analysis, Sucrose, Glucose, Sodium monofluoroacetate.

Under anaerobic conditions and in the absence of CO2, the thermophilic blue-green alga Synechococcus lividus Y52-s evolved hydrogen sulfide in both darkness and light. The mechanism of this process was investigated and compared with photo- and dark reductions in organisms representing several phyla. The photoproduction of H2S from either sulfate or thiosulfate was inhibited by 3-(3,4-dichlorophenyl)-1, 1-dimethyl urea (DCMU) and carbonyl m-chlorophenyl-hydrazone (m-C1-CCP). The inhibitory effect of DCMU showed the requirement for photosysytem II as electron donor. Inhibition by m-C1-CCP also implicated ATP as an energy source. Monofluoroacetate partially inhibited photoproduction of H2S. This indicated that oxidative metabolism may act as a source of electrons to reduce the photooxidant under certain conditions. Thiosulfate acts only as electron acceptor and is reductively cleaved to sulfide and sulfite ions. Thiosulfate and sulfate appeared to replace CO2 in the light and O2 in darkness as electron acceptors. The phosphorylation uncouplers dinitrophenol and m-C1-CCP stimulated dark H2S production. (Holoman-Battelle)
W74-07546

EFFECT OF LIGHT INTENSITY AND GLYCEROL ON THE GROWTH, PIGMENT COMPOSITION, AND ULTRASTRUCTURE OF CHROOMONAS SP.,
Smithsonian Institution, Rockville, Md. Radiation Biology Lab.
M. A. Faust, and E. Gantt.
Journal of Phycology, Vol 9, No 4, p 489-495, December 1973. 7 fig, 1 tab, 17 ref.

Descriptors: *Plant growth, *Plant pigments, *Light intensity, Environmental effects, Solvent extractions, Aquatic algae, Electron microscopy, Carbohydrates, Plant physiology, Cultures.
Identifiers: *Chroomonas, *Glycerol, *Ultrastructure, *Algal physiology, Sample preparation, Heterotrophic nutrition, Cryptomonads, Chlorophyll a, Chlorophyll c, Phycocyanin, Culture media, Substrate utilization, Sugars.

Growth of Chroomonas sp. increased with light intensity (100, 1800, and 2700 microwatts/sq cm) with a five-fold increase from the lowest to the highest intensity. Chlorophyll and phycocyanin content per cell were greater in cells grown at low light intensity, but the ratio of chlorophyll a and c did not vary appreciably. Cells grown at low light intensity had 30 percent more phycocyanin than cells grown at high intensities of light. The chloroplast of cells with the higher phycocyanin content had average intrathylakoidal widths of 300 A, whereas those cells with the lower phycocyanin content had average intrathylakoidal widths of 200 A. This result is compatible with the hypothesis that phycocyanin is located in the intrathylakoidal spacein the cryptophyte algae. Of the various energy sources tested, only glycerol was able to support limited growth under nonphotosynthetic conditions. Under no condition was the chloroplast reduced to an etioplast or proplastid state. Starch accumulation was greatest in cells grown in continuous white light in glycerol. Eyespots were commonest in cells grown in darkness and interrupted every 24 hr by a few seconds of white light. It was concluded that this organism is an obligate phototroph. (Holoman-Battelle)
W74-07548

A CONTINUOUS CULTURE STUDY OF PHOSPHATE UPTAKE, GROWTH RATE AND POLYPHOSPHATE IN SCENEDESMUS SP.,
New York State Dept. of Health, Albany. Div. of Labs. and Research.
G-Y. Rhee.
Journal of Phycology, Vol 9, No 4, p 495-506, December 1973. 16 fig, 1 tab, 62 ref.

Descriptors: *Phosphates, *Growth rates, *Scenedesmus, *Absorption, *Path of pollutants, Kinetics, Cultures, Plant growth, Aquatic algae, Phosphorus, Lipids, Nutrients, Plant physiology.
Identifiers: *Polyphosphates, Continuous cultures, *Algal physiology, Substrate utilization, Enzyme activity, Enzymatic inhibitors, Substrate concentration, Sample preparation, Alkaline phosphatase.

The kinetics of phosphate uptake and growth in Scenedesmus sp. have been studied in continuous culture with particular reference to the shifts in the cellular P compounds as a function of growth rate. Uptake velocity is a function of both internal and external substrate concentrations and can be described by the kinetics of noncompetitive enzyme inhibition. The concentrations of polyphosphates (alkali-extractable or 7-min) can be substituted as inhibitors in the kinetic equation. The apparent half-saturation constant or uptake, K sub m, is 0.6 microM, growth is less than K sub m by 1 order of magnitude. Growth is a function of cellular P concentrations, and the polyphosphates (alkali-extractable or 7-min) appear to regulate growth rate directly or indirectly. To understand P limitation, therefore, it is necessary to measure both external P and internal polyphosphate levels. Evidence indicates that alkali-extractable polyphosphates, which can be quantitatively determined by a simple method of measuring surplus P, are involved in cell division process and that a maintenance concentration of functional phosphate exists in the form of polyphosphates. Alkaline phosphatase activity has an inversely linear relationship to growth rate and to the reciprocals of both polyphosphates and surplus P. Changes in lipid P, RNA P, and presumably all other forms except DNA are related to changes in growth rate. (Holoman-Battelle)
W74-07549

THE EFFECT OF SELENITE ON THE PHYSIOLOGICAL AND MORPHOLOGICAL PROPERTIES OF THE BLUE-GREEN ALGA PHORMIDIUM LURIDUM VAR. OLIVACEA,
Medical Coll. of Ohio, Toledo. Dept. of Microbiology.
M. Sielicki, and J. C. Burnham.
Journal of Phycology, Vol 9, No 4, p 509-514, December 1973. 6 fig, 16 ref.

Descriptors: *Plant morphology, *Cyanophyta, *Bioassay, Photosynthesis, Inhibition, Plant growth, Water pollution effects, Plant physiology, Aquatic algae, Poisons, Lethal limit, Proteins, Pollutants.
Identifiers: *Phormidium luridum var. olivacea, *Selenite, *Algal physiology, Pollutant effects, Light microscopy, Sodium selenite.

Phormidium luridum cultures were treated with sodium selenite in concentrations ranging from 1 microM to 0.01 M. In contrast to the increasing culture turbidity of control and 1 microM selenite cultures, the turbidity of the other selenite cultures declined in proportion to time and selenite concentration. Chlorophyll extraction revealed similar results. Photosynthetic activity was inhibited within 6 hr in all cultures except control and 1 microM selenite. Phormidium at concentrations greater than 1 microM selenite showed a gradual loss of the bright green color and turned semitransparent. Cell-associated granules of reduced selenium were observed at higher selenite concentrations. Other structural changes observed were the presence of intracellular and intercellular spaces, spheroplast formation, and gradual cell lysis. Protein analyses of total cell samples and supernatant fractions confirmed cellular breakdown of selenite-treated algal cells. (Holoman-Battelle)
W74-07550

BYGLANDSFJORDEN. PRIMARY PRODUCTION AND OTHER LIMNOLOGICAL FEATURES IN AN OLIGOTROPHIC NORWEGIAN LAKE,
Oslo Univ. (Norway). Dept. of Limnology.
A. Lande.
Hydrobiologia, Vol 42, Nos 2-3, p 335-344, August 15, 1973. 3 fig, 2 tab, 14 ref.

Descriptors: *Primary productivity, *Trophic level, *Water quality, *Oligotrophy, Dissolved oxygen, Hydrogen ion concentration, Specific conductivity, Calcium, Magnesium, Sodium, Potassium, Chlorides, Alkalinity, Sulfates, Water analysis.
Identifiers: *Norway(Byglandsfjorden).

Byglandsfjorden is a lake situated in southern Norway, about 80 km north of Kristiansand. The catchment area consists of archean rocks. The river Otra flows through the lake. Water samples were taken from the lake 4 times during the summer of 1971, and analyzed for DO, pH, specific conductivity, Ca, Mg, Na, K, alkalinity, chloride, and sulfate. Primary productivity was measured three times by the C-14 method. The results show that the lake is acid and poor in electrolytes. pH-values vary between 5.3 and 6.0, and the specific conductivity lies at about 10. Primary production is rather high, and per sq m lake surface the values are about the same as in Svinsjoen, a rather eutrophic lake near Oslo. However, an index used by Rodhe (1965) shows that the lake is of a more oligotrophic type. (Little-Battelle)
W74-07554

HABITAT DISTRIBUTION OF THE SHORE FLIES OF NORTHEASTERN OHIO (DIPTERA: EPHYDRIDAE),
Kent State Univ., Ohio. Dept. of Biological Sciences.
J. F. Scheiring, and B. A. Foote.
The Ohio Journal of Science, Vol 73, No 3, p 152-166, May 1973. 10 fig, 19 ref.

Descriptors: *Ohio, *Aquatic habitats, *Ecological distribution, *Aquatic insects, Diptera, Seasonal, Animal populations, Shores, Mud, Sands, Grassed waterways, Floating plants.
Identifiers: *Shore flies, Species diversity, Limnic wrack, Sedge meadow, Marsh reed, Mud shore, Sand shore, Grass shore, Floating algal, Rain pool, Salt pool, Athyroglossa granulosa, Athyroglossa ordinata, Atissa litoralis, Ptilomyia enigma, Pseudohecamede, Allotrichoma, Discocerina obscurella, Hydrochasma buccatum, Diclasiopa lacteipennis, Ditrichophora, Polytrichophora orbitalis, Psilopa dupla, Leptopsilopa atrimana, Trimerina madizans.

A study of the babitat distribution of 68 species of shore flies (Ephydridae) was carried out in northern Ohio between April, 1968 and November, 1969. Ten ephydrid habitats were recognized: mud-shore, sand-shore, grass-shore, limnic-wrack, marsh-reed, sedge-meadow, floating-vegetation, floating-algal-mat, rain-pool, and salt-pool habitats. The mud shore contained the greatest diversity of Ephydridae, whereas the salt-pool habitat produced the largest populations. The floating algal mat possessed the fewest number of species, as well as the least number of individuals. Three species were recorded from Ohio for the first time: Atissia litoralis (Cole), Ephydra cinera Jones, and E. niveicips Cresson. A listing of all species collected, together with information on habitat from which taken abundance, and relation of data to other published material, is also included. (Holoman-Battelle)
W74-07556

EFFECTS OF TEMPERATURE ON ACTIVITY AND MORTALITY OF THE SCYPHOZOAN MEDUSA, CHRYSAORA QUINQUECIRRHA,
Maryland Univ. Prince Frederick. Natural Resources Inst.
A. J. Gatz, Jr., V. S. Kennedy, and J. A. Mihursky.
Chesapeake Science, Vol 14, No 3, p 171-180, September 1973. 6 fig, 3 tab, 23 ref.

Descriptors: *Water temperature, *Mortality, *Sea nettles, *Laboratory tests, *On-site tests, Marine animals, *Chesapeake Bay, Lethal limit, Jelly fish, Mature growth stage, Immature growth stage, *Maryland.
Identifiers: Activity, Chrysaora quinquecirrha, Coelenterates, Medusa, Scyphozoans, Data interpretation, Polyps, Pulsation rate.

Pulsation rate of Chrysaora quinquecirrha medusae was inversely and linearly related to bell diameter over the natural temperature range (15-32C) of this life history stage of the sea nettle in the upper Chesapeake Bay. At unnatural, elevated temperatures this relationship was disrupted. Pulsation rates generally increased with temperature increase from 15C to 30C and then decreased at higher temperatures. The rate-temperature curve for acclimated medusae was similar in shape (increase and decrease in pulsation rate with temperature change) to rate-temperature curves reported for warm water medusae; its shape was different from those reported for cold water medusae. Acclimation of pulsation rate to changed temperature was faster than acclimation of upper lethal temperature, although both were measured in hours. Upper lethal temperatures measured over 20-30C were directly related to acclimation temperature and were similar to those reported for sea nettle polyps (34-35C). Medusae were more sensitive than polyps to cold, with death occurring at 10C. Thermal discharges into the upper Chesapeake Bay which raise water temperature above 30C are probably stressful to sea nettle medusae. Temperatures above 38C could be lethal in a few minutes. (Holoman-Battelle)
W74-07561

INCIDENCE OF RESISTANCE TO TETRACYCLINE, CHLORAMPHENICOL AND AMPICILLIN AMONG SALMONELLA SPECIES ISOLATED IN THE NETHERLANDS IN 1969, 1970 AND 1971,
Rijksinstituut voor de Volksgezondheid, Bilthoven (Netherlands).
C. E. Voogd, P. A. M. Guinee, A. Manten, and J. J. Valkenburg.
Antonie van Leeuwenhoek, Vol 39, No 2, p 321-329, 1973. 7 tab, 2 ref.

Descriptors: *Antibiotics(Pesticides), *Salmonella, Domestic animals, Enteric bacteria, Aerobic bacteria, Water pollution sources, Resistance, Isolation, Poultry, Cattle, Hogs, Farm wastes.
Identifiers: *Tetracycline, *Ampillicin, *Chloramphenical, *Kanamycin, Drug resistance, Serotypes, Culture media, Salmonella dublin, Salmonella typhimurium, Salmonella anatum, Salmonella panama, Salmonella cholerae suis var. kunzendorf, Salmonella infantis, Salmonella montevideo, Salmonella eimsbuettel, Salmonella brandenburg, Salmonella bredeney, Salmonella derby, Salmonella enteritidis, Salmonella heidelberg, Salmonella manchester, Salmonella meleagridis, Salmonella mokola, Salmonella muenchen.

In 1969, 1970 and 1971 respectively, 11761, 13844 and 20053 Salmonella strains were screened for resistance to ampicillin, chloramphenicol and tetracycline. Each Salmonella strain was transferred to agar slants containing 25 micrograms of tetracycline, 50 micrograms of chloramphenicol, 25 micrograms of ampicillin or 25 micrograms of kanamycin per milliliter at pH 7.4. If growth occurred, the bacteria were identified again in order to exclude any possibility of contamination with drug-resistant bacteria of other species. If the same serotype was found, the degree of resistance was determined by tube-dilution assay on 5 percent sheep-blood agar slants made of nutrient agar pH 7.4 to which citrated sheep blood was added. The tubes were inoculated with one drop of a dilute suspension containing 1 million bacteria per ml in 0.85 percent NaCl solution. After incubation at 37 C for 20 hours any strain growing in tubes containing one of the above antibiotics at a concentration of 50 micrograms/ml was considered to be resistant. This drug level roughly corresponds to 10 times the normal minimal inhibitory concentration. It was found that in these years respectively 23.4 percent, 19.3 percent and 15.1 percent of the isolated strains were resistant to one or more of these antibiotics. Most strains appeared to be only tetracycline-resistant. Resistance to chloramphenicol remained low (0.56 percent and less). During 1971 64 kanamycin-resistant strains (0.32 percent) were isolated. Resistance was largely confined to S. typhimurium and S. panama. (Holoman-Battelle)
W74-07562

PSYCHROPHILIC YEASTS ISOLATED FROM MARINE FISH,
University of Strathclyde, Glasgow (Scotland). Dept. of Applied Microbiology.
For primary bibliographic entry see Field 5A.
W74-07563

EFFECT OF RESTRICTED USE OF PHOSPHATE-BASED DETERGENTS ON ONONDAGA LAKE,
O'Brien and Gere Engineers Inc., Syracuse, N. Y.
C. B. Murphy, Jr.
Science, Vol 182, No 4110, p 379-381, October 26, 1973. 2 fig, 1 tab, 9 ref.

Descriptors: *Phosphates, Lakes, *Detergents, Legislation, Diatoms, Chlorella, Scenedesmus, *Cyanophyta, Chlorophyta, Hydrogen ion concentration, Nitrogen, Biochemical oxygen demand, Dissolved oxygen, *New York, Analytical techniques, Hypolimnion, Limiting factors, Sewage effluents, Water sampling, Carbon, Water quality, Epilimnion, Eutrophication, Nutrients.
Identifiers: *Onondaga Lake(NY), Oocystis, Orthophosphates, Aphanizomenon.

A marked decrease in the concentration of total inorganic phosphate in the epilimnion and hypolimnion of Onondaga Lake, New York State, has been observed during the 1 1/2 years between July 1971 and January 1973. A monitoring program for Onondaga Lake has been carried out since 1968. Grab samples, collected every 2 weeks at 3-m intervals from the surface to the bottom at a station located in the southern basin, have shown decreases of 85 and 76 percent in the average condensed inorganic phosphate concentrations in the epilimnion and hypolimnion, respectively. The orthophosphate concentrations were found to decline by 47 and 15 percent, respectively, over the same period of time. Standard analytical procedures were used to determine the concentrations of total orthophosphate, total inorganic phosphate, and the derived value for total condensed inorganic phosphate. In the past 5 years, a characteristic seasonal succession of phytoplankton has been observed within the lake. There is little growth of plankton in the winter, when the lake is covered by ice; a diatom population develops in the spring; and the green algae Chlorella, Scenedesmus obliquus, Scenedesmus quadricauda, and Oocystis parva dominate the summer period. Blue-green algae of the genus Aphanizomenon follow the die-off of the greens, and dominate the late summer and early fall. In 1972, Aphanizomenon was absent in the succession. Instead, the green algae blooms continued through the summer and fall with cell counts comparable to those measured in previous years. It appears that the alteration of the phytoplankton seasonal succession is the result of reducing the phosphorus concentrations in the photic zone. (Mortland-Battelle)
W74-07566

ACETYLENE REDUCTION BY BEIJERINCKIA UNDER VARIOUS PARTIAL PRESSURES OF OXYGEN AND ACETYLENE,
Ibadan Univ. (Nigeria). Dept. of Agronomy.
E. D. Spiff, and C. T. I. Odu.
Journal of General Microbiology, Vol 78, No 2, p 207-209, October 1973. 1 fig, 9 ref.

Descriptors: *Oxygen, *Nitrogen fixing bacteria, *Nitrogen fixation, Soil bacteria, Methodology, Environmental effects, Nitrogen.
Identifiers: *Beijerinckia indicum, *Acetylene reduction, *Acetylene, Partial pressures, Enzyme activity, Substrate utilization, Fate of pollutants, *Bacterial physiology, Flame ionization gas chromatography, Nitrogenases, Ethylene.

Different partial pressures of acetylene and oxygen greatly affect the level of acetylene reduction by Beijerinckia, a nitrogen-fixing bacterium found in some acidic tropical soils. Nitrogenase activity was measured by the acetylene reduction technique using three replicate vials for each treatment. A milliliter-sample of Beijerinckia culture was usually injected to initiate the reaction and the reaction was usually terminated by injecting 5 N H2SO4 into the reaction mixture. The vials were incubated in a 30 C water bath with reciprocal shaking (152 strokes/min). The ethylene produced was measured by flame ionization gas chromatography. Acetylene reduction increased with an increase of pC2H2 up to 0.74 atm. Acetylene reduction was linear for at least 40 min. The oxygen partial pressure also affected activity with most acetylene reduction at a pO2 of 0.15 atm for liquid cultures grown in air. (Holoman-Battelle)
W74-07572

IN VITRO FORMATION OF NITRATE REDUCTASE USING EXTRACTS OF THE NITRATE REDUCTASE MUTANT OF NEUROSPORA CRASSA, NIT-1, AND RHODOSPIRILLUM RUBRUM,
Oakland Univ., Rochester, Mich. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W74-07577

THE EFFECT OF LACK OF A CARBON SOURCE ON NITRATE-REDUCTASE ACTIVITY IN ASPERGILLUS NIDULANS,
La Trobe Univ., Bundoora (Australia). Dept. of Genetics.
M. J. Hynes.
Journal of General Microbiology, Vol 79, No 1, p 155-157, November 1973. 1 fig, 10 ref.

Descriptors: *Cultures, *Inhibitors, *Carbon, Limiting factors, Bioassay, Enzymes, Biochemistry, Fungi.
Identifiers: *Aspergillus nidulans, *Nitrate reductase, *Culture media.

Mycelia of Aspergillus nidulans were grown under inducing conditions and then transferred to various media and incubated further. Samples were harvested at various intervals and assayed to study the effect of carbon starvation on nitrate-reductase activity. Nitrate-reductase activity rapidly disappeared in medium in which further synthesis of the enzyme was not possible or in medium lacking a carbon source. Absence of inducer and repression by ammonium caused rapid loss of activity. Cycloheximide, at 10 micrograms/ml, only slightly reduced the rate of enzyme loss and, in fact, cycloheximide itself caused loss of nitrate-reductase activity. A lower concentration of cycloheximide (1 microgram/ml) has a similar effect. Methylammonium chloride caused rapid loss of activity in this strain. An even greater rate of enzyme disappearance was found when mycelium was starved for carbon. An attempt to demonstrate in vitro inactivation of nitrate reductase and glutamate dehydrogenase by mixing crude mycelial extracts and incubating was not successful. However, this experiment did show that it was unlikely that accumulation of an inhibitor of the enzymes during carbon starvation could account for the results. Pre-induced beta-galactosidase activity is not rapidly lost from carbon-starved mycelium, nor does the activity of this enzyme increase in medium lacking a carbon source in the absence of an inducer. Therefore it seems that various enzymes show different responses to carbon starvation and different absolute requirements for the presence of inducer. In the case of nitrate reductase there is an absolute requirement for inducer and for the presence of a carbon source. (Little-Battelle)
W74-07581

NATURE AND TOXICITY OF TWO OXYCHLORDANE PHOTOISOMERS,
Agricultural Research service, College Station, Tex. Veterinary Toxicology and Entomology Research Lab.
G. W. Ivie.
Journal of Agricultural and Food Chemistry, Vol 21, No 6, p 1113-1115, November/December 1973. 1 fig, 1 tab, 18 ref.

Descriptors: *Pesticide toxicity, Degradation(Decomposition), Light.
Identifiers: *Oxychlordane, *Photodecomposition, *Photoisomers, Chlordane, Sample preparation, Photooxidation, Isomers.

A mixture of 2.5 mmol each of oxychlordane and xanthone in 50 ml of chloroform was streaked over the surface of several 0.25-mm silica gel chromatoplates to a concentration of about 0.2 mg of oxychlordane/sq cm. The plates were exposed to direct sunlight for 24 hr over a period of 3 days; then the gel was scraped and the products were extracted with chloroform. Tlc revealed two major photoproducts in addition to the parent compound. These derivatives were methylene-bridged isomers, one containing a keto group generated by photochemical cleavage of the oxychlordane oxirane ring and the other with an intact epoxide moiety. Their information was greatly accelerated by xanthone photosensitizer. Oxychlordane and its keto photoisomer are quite toxic to white mice, but the second isomer is of very low toxicity. (Little-Battelle)
W74-07584

BACTERIA-ASSIMILABLE ORGANIC COMPOUNDS, PHOSPHATE, AND ENHANCED GROWTH OF BACTERIA-ASSOCIATED BLUE-GREEN ALGAE,
Cincinnati Univ., Ohio. Tanners' Council Lab.
W. Lange.
Journal of Phycology, Vol 9, No 4, p 507-509, December 1973. 20 ref.

Descriptors: *Aquatic bacteria, *Aquatic algae, *Eutrophication, *Nutrients, *Algal control, *Water pollution control, Organic compounds, Limiting factors, Plant growth, Plant physiology, Cyanophyta, Nutrient requirements, Phosphorus, Cobalt, Iron, Lake Erie, Water quality control.
Identifiers: *Algal physiology, Organic carbon, Metal chelates, Species interaction, Assimilation.

The complexities of algal physiology and nutrition make it likely that diverse and often substantial nutrient limitation will be required to control eutrophication in different situations. In defense of a policy exemplified by the generalization 'phosphorus is the primary limiting nutrient in most lakes,' Schindler of the Canadian Freshwater Institute has misquoted the work of Lange. Key points of Lange's conclusions are properly quoted, and the reader is cautioned against an oversimplification of a single approach to algal control. (Holoman-Battelle)
W74-07587

EFFECT OF ANHYDROUS AMMONIA ON A CENTRAL TEXAS POND, AND A REVIEW OF PREVIOUS RESEARCH WITH AMMONIA IN FISHERIES MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Biology.
M. A. Champ, J. T. Lock, C. D. Bjork, W. G. Klussmann, and J. D. McCullough, Jr.
Trans Am Fish Soc., Vol 102, No 1, p 73-82, 1973. Illus.
Identifiers: *Ammonia(Anhydrous), Crayfish, *Fisheries management, Frogs, Phytoplankton, Ponds, Reviews, Shrimp, *Texas, Vegetation, Zooplankton.

A pond located on the Texas A and M University range area, College Station, (1.78 surface ha, 40-427 m3) was treated with anhydrous ammonia in Nov. 1968, for evaluation of this technique for simultaneous fish eradication, pond fertilization, and aquatic vegetation control. The effect of such treatment on pond ecology is reported. Chemical, physical, and biological data were taken 1 wk prior to, on the day of, and at selected intervals for 12 mo. following treatment. Ammonia N levels before treatment were 0.2 to 0.4 ppm. The day after treatment the ammonia N level stabilized to 37.7 ppm and gradually declined to 5.0 ppm after 3 mo. The pH before treatment was 6.9. A maximum pH of 10.3 was recorded during treatment and it stayed above 9.0 for 2 wk following treatment. Titratable CO2 decreased as the pH and carbonates increased. Phytoplankton counts were reduced by 96% and zooplankton counts were reduced 99% following treatment. Rooted aquatic vegetation was decimated. Dead frogs and tadpoles were observed. The most adversely affected macroinvertebrates were crayfish and freshwater shrimp. A total fish kill was indicated since no live fish were taken by trawl, or seine, and none were observed after treatment.--Copyright 1973, Biological Abstracts, Inc.
W74-07595

PHARMACODYNAMICS OF METHYL MERCURY IN THE RAINBOW TROUT (SALMO GAIRDNERI): TISSUE UPTAKE, DISTRIBUTION AND EXCRETION,
State Univ. of New York, Buffalo. Dept. of Biochemistry.
F. J. Giblin, and E. J. Massaro.
Toxicol Appl Pharmacol. Vol 24, No 1, p 81-91, 1973. Illus.
Identifiers: *Distribution, Excretion, *Methyl mercury, *Rainbow trout, Salmo-Gairdneri, Scintillation spectrometer, *Absorption, Fish tissue.

The tissue distribution, rate of uptake and concentration of 203 Hg-labeled methyl mercury was investigated in 20 different tissues/organs over a period of 100 days following a single intragastric dose of 0.5 Hg/kg body weight. Mercury content was analyzed by gamma scintillation spectrometry. After 1 hr, mercury concentration factors > 0.1 were detected in the blood, heart, liver, spleen and kidney (a concentration factor (CF) of 1.0 equals mercury concentration in dose). Highest mercury concentrations (CF > 7.0) were observed in the blood (at 7 days) and spleen (at 14 days). After 100 days, the CF of the blood was >2.0 and the CF values of the spleen, Kidney and liver were >1.0. Maximum CF values were reached in the skeletal muscle, brain and lens after 34, 56 and >90 days respectively. Maximum values were reached in most other tissues.organs at approximately 7 days. Skeletal muscle appeared to function as a reservoir for methyl mercury and accumulated 50% of the dose from 34-100 days post administration. Methyl mercury accumulation in the brain was limited to 0.1% of the dose. The rate of mercury excretion appeared to be biphasic as a result of a slow elimination from the skeletal muscle relative to the other tissues/organs. Employing both the slow and fast rate, the half-retention time for methyl mercury in rainbow trout was estimated to be >200 days. The toxicity to humans of methyl mercury present in fish tissues was mentioned.--Copyright 1973, Biological Abstracts, Inc.
W74-07597

5D. Waste Treatment Processes

SANITARY SERVICES IN TENNESSEE, 1972.
Tennessee State Planning Office, Nashville.
Available from the National Technical Information Service as PB-221 531, $7.50 in paper copy, $1.45 in microfiche. Final Report. May 1973. 102 p, 15 tab. HUD CPA-TN-04-33-1006.

Descriptors: *Utilities, *Water supply, *Sewerage, *Waste disposal, *Tennessee, Waste dumps, Rates, Sources of supply(Water), *Treatment facilities.
Identifiers: *Sanitary services inventory.

This tabulation of data on water and sewer systems, and refuse and garbage collection services in Tennessee was compiled by means of mailed questionnaires. Information on those systems which did not respond to the 1972-1973 questionnaire was, where available, repeated from the last report from those systems. Data on water and sewer systems in 279 cities and towns, arranged by population groupings, include information on the water source, daily capacity, the receiving stream (sewer), types of water treatment, types of sewer treatment, sewage output, net monthly rates for residential and non-residential users, the date the rates became effective, the number of customers during the last fiscal year, and gross revenue for that year. Data on 136 utility districts are similarly arranged. Refuse and garbage collection data are provided for 204 cities and towns, also arranged by population groupings. Included are data on the type of service provided, method of disposal, frequency of residential and commercial collection, and charges for residential

and commercial services. (Hoffman-North Carolina)
W74-07060

PRELIMINARY WATER AND SEWER PLAN FOR ALCORN, BENTON, MARSHALL, PRENTISS, TIPPAH, TISHOMINGO COUNTIES.
Northeast Mississippi Planning and Development District, Booneville.
Available from the National Technical Information Service as PB-223 320, $3.00 in paper copy, $1.45 in microfiche. April 1973. 16 p, 6 fig. HUD CPA-MS-04-25-1002.

Descriptors: *Sewerage, *Water supply development, Water wells, *Mississippi, *Water demand, *Projections, *Planning.
Identifiers: Alcorn County(Miss), Benton County(Miss), Marshall County(Miss), Prentiss County(Miss), Tippah County(Miss), Tishomingo County(Miss).

Existing water and sewer systems in the Northeast Mississippi Planning and Development District (NEMPDD) are inventoried. Proposed systems are based upon a preliminary analysis taking into consideration present and future needs, demands and desirability, excluding, however, any evaluation of economic feasibility. A detailed planning study and economic feasibility analysis will follow. Practically every municipality in NEMPDD's jurisdiction needs to expand and improve its existing sewer system. Most municipalities fail to serve the entire population within their corporate limits and even fewer serve the entire limits of the urban area. The preliminary sewer plan also proposes sewage facilities be constructed in the Yellow Creek Industrial Park in Northeast Tishomingo County. Water in NEMPDD's jurisdictional area is of uniformly high quality, and is primarily derived from wells. However, industrial demand for water quality of a higher standard, and a general decrease in recent years in the level of ground water tables, indicate the need for additional treatment facilities. One alternate would be a regional water supply grid system for Alcorn, Prentiss, Tippah, and Tishomingo Counties. A water filter plant on the Yellow Creek embayment of Pickwick Lake would be the primary water source for this system. (Hoffman-North Carolina)
W74-07062

WATER AND WASTEWATER SYSTEMS INVENTORY - REGION H, NORTH CAROLINA,
Pee Dee Council of Governments, Troy, N.C.
N. W. Chesson, and R. M. O'Brien.
Available from the National Technical Information Service as PB-222 565, $4.00 in paper copy, $1.45 in microfiche. July 1973. 32 p, 1 fig. NCP 1006-NM-5.

Descriptors: *Water supply, *Water sources, *Waste water treatment, *Waste water disposal, *North Carolina, Municipal wastes, Waste treatment, Water pollution, Water quality, Sewage effluents, Water treatment, Sewage treatment, Tertiary treatment, Water pollution sources, Water resources development, Water demand, Water policy, Waste disposal, Municipal water.
Identifiers: Anson County(NC), Montgomery County(NC), Moore County(NC), Richmond County(NC), *Regional planning.

Proposed and existing water and wastewater systems in Anson, Montgomery, Moore, and Richmond Counties of North Carolina are described and serve as a base for the regional plan being developed by the Pee Dee Council of Governments. While natural boundaries separate these counties and cause projects to be county-or sub-county-wide, region-wide projects are being studied. Water is abundant in the region, but many sub-areas are remote from the sources. These sub-areas are susceptible to contamination and will be costly in terms of the extent of treatment required; therefore, they are priority areas for water resource planning. Satisfactory wastewater disposal sites are not locally accessible to a large portion of Region H since most streams are too small to accept volume effluent discharges. Wastewater treatment plants must also be capable of tertiary treatment levels, and no plant is presently capable of this level. Regional wastewater systems planning is therefore a high priority. Several older communities must install wastewater facilities to avoid polluting nearby watersheds. Regional outfall and treatment systems should make these installations feasible. Significant development should not be undertaken until water quality determinations are made for that area. (Grden-North Carolina)
W74-07063

WALLOWA LAKE BASIN COMPREHENSIVE PLAN.
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
Available from the National Technical Information Service as PB-224 147, $5.25 in paper copy, $1.45 in microfiche. Prepared for Board of County Commissioners, Wallowa County, Enterprise, Oregon. Comprehensive Plan, 13 p. (uncut) 4 fig, 2 tab and Technical Supplement, May 1973. 33 p, 2 fig, 1 tab, 1 append.

Descriptors: *Water zoning, *Urbanization, *Land use, Lake basins, *Comprehensive planning, Land development, Lake shores, Water distribution(Applied), Sewers, Sewerage, Public utilities, Costs, Lakes, Zoning, Local governments, *Oregon.
Identifiers: *Lake Wallowa(Ore), Joseph(Ore).

A Land Use Plan for long-range development and environmental protection of natural and scenic amenities of the Wallowa Lake Basin in Oregon is presented. The Plan outlines service areas for the provision of public water and sewerage facilities. These services are necessary to public health and safety as well as in preserving the high water quality of Wallowa Lake. Preliminary designs for water and sewer, showing general location and type of facilities necessary and cost estimates are given. Limited development will continue on the south, west, and north sides of the lake. A sewer collection system will serve these areas and will connect to the City of Joseph's system. A separate water system will serve the south and west portion of the lake while an improved Joseph water system will serve the north shore area. In light of the Land Use Plan, recommendations for updating the County Zoning Ordinance are also suggested. These include the addition of zones for rural-residential, open space, resort-residential, and timber; the modification of present C-2 zone which allows for the uncontrolled mix of residential and commercial uses; increasing minimum lot sizes for the agricultural zones; and amendment of the zoning map to conform with the Land Use Plan. (Hoffman-North Carolina)
W74-07065

UTILITIES AND FACILITIES FOR NEW RESIDENTIAL DEVELOPMENT: A SURVEY OF MUNICIPAL POLICY,
Urban Land Inst., Washington, D.C.
J. R. McKeever.
Technical Bulletin No 27, December, 1955. 100 p, 5 tab.

Descriptors: *Planning, *Water supply, *Sewerage, *Financing, *Urbanization, *Land development, *Utilities, Water demand, Surveys, Cities, Sewers, Political aspects, Legal aspects.
Identifiers: Utility extension, Subdivision regulations, Land developers, Questionnaire, Urban growth, Urban counties, Sanitary sewers, Water mains, Municipalities.

Responsibility for utility installation has gradually shifted from the municipality to the land developer in suburban growth. Many local governments cannot cope financially with the necessary expenditures nor can individual homeowners carry the burden of property tax levies. Thus municipalities upgrade their requirements governing the development of land and shift the responsibility. Friction arising between developers and the municipality over the matter of who installs and pays for utilities and facilities comes when developers want to avoid their proper responsibilities, or when approval authorities strive to overreach the extent of their assigned functions. Subdivision regulations must adequately differentiate between improvements required for the immediate project and those needed to serve a territory beyond. Based on this 1955 survey of the responding cities (115 out of 140) having 50,000 or more population, 61% required the developer to pay for all water mains where called for by subdivision regulations, 78% for all sanitary sewers, and 71% for all storm sewers. In 64% of the cities replying, the developer was not reimbursed for any installation costs on these and other utilities such as sidewalks and paving. In 43% of the cities, the city paid the cost of larger water and sewer mains when these were needed to serve development outside the subdivision. In urban counties, the trend is toward requiring the developer to pay for items required to transform raw acreage into finished house sites. (Edwards-North Carolina)
W74-07071

WATER QUALITY MANAGEMENT ELEMENT FOR THE KENTUCKY RIVER AREA DEVELOPMENT DISTRICT COMPREHENSIVE WATER AND SEWER PROGRAM.
Mayes, Sudderth and Etheredge, Inc., Lexington, Ky.
Available from the National Technical Information Service as PB-223 046; $6.75 in paper copy, $1.45 in microfiche. HUD-CPA-KY-04-35-1000.

Descriptors: *Stream pollution, *Water supply, *Water quality control, Waste water(Pollution), Water pollution sources, Sewerage, Coal mines, Mine wastes, *Waste water treatment, Sewage lagoons, Kentucky, Treatment facilities.
Identifiers: *Kentucky River, Kentucky River Area Development District.

The Kentucky River Area Development District contains most of the headwaters of the Kentucky River, one of the principal rivers in Kentucky. Many municipalities, both within and without the District use it as a water supply source. Consequently, pollution of the river is of great concern. There are 3 major sources of pollution in the Kentucky River: coal mining activities, untreated domestic waste, and municipal plant effluents. A major hindrance to the reduction or elimination of the pollution problems has been the lack of water quality data, including knowledge on the exact source of the pollution, the magnitude of the pollution, and mine site locations. A District-wide Authority would be the best vehicle for a coordinated approach to water quality control. The Authority would be responsible for all potable water production facilities and such water distribution facilities that would elect to join the Authority, plus all the sewage treatment facilities in the District and the sewage collection facilities that elect to join the Authority. The need for additional sewage collection and treatment facilities in the individual service areas is set forth. Alternate methods of sewage treatment include the use of tertiary lagoons, where physically possible, and advanced tertiary treatment facilities. (Hoffman-North Carolina)
W74-07077

INTERIM STORM DRAINAGE PLAN REPORT-LITTLE ROCK-NORTH LITTLE ROCK METROPOLITAN AREA.
Metroplan, Little Rock, Ark.
Available from the National Technical Information Service as PB-221 037; $6.00 in paper copy,

$1.45 in microfiche. March, 1973. 71 p, 9 fig, 2 tab, 2 append. HUD-CPA-AA-06-37-1008.

Descriptors: *Storm runoff, *Storm drains, *Flood control, *Drainage systems, *Storm water, Cities, Costs, Subsurface drainage, *Arkansas, Drainage programs, Drainage engineering.
Identifiers: *Little Rock metropolitan area(Ark), Pulaski County(Ark.), Saline County(Ark.), Fourche Creek(Ark.).

A compilation of the existing storm water plans and flood control reports for local governments in the Little Rock-North Little Rock SMSA is given. Essentially these, when regarded collectively, cover most of the urban and urbanizing area in Pulaski and Saline Counties. Part One of this report focuses on the City of Little Rock including most aspects of storm water drainage, i.e. basic hydrology, topography, inventory of existing drainage facilities, drainage plans, cost estimates and priorities for recommended improvements. Maps which show existing and proposed storm drainage facilities are located by reference. Part Two suggests solutions for areas in Pulaski County where major problems already exist and where increasingly serious problems will develop as urban development continues. Preliminary engineering studies are given for Fourche Creek, Fourche Island, Dark Hollow, White Oak Bayou and Bayou Meto. The cities' deficiencies, short range plans and priorities for additional storm water facilities are assessed. For the benefit of those cities without a program an appendix is included which displays unit costs for engineering and construction services. (Hoffman-North Carolina)
W74-07082

CATALYTIC OXIDATION OF PHENOL IN DILUTE CONCENTRATION IN AIR,
Delaware Univ., Newark. Dept. of Chemical Engineering.
M. A. Walsh, and J. R. Katzer.
Industrial and Engineering Chemistry, Process Design and Development, Vol 12, No 4, p 477-481, 1973. 3 fig, 2 tab, and 27 ref. OWRR A-014-DEL(6), 14-31-0001-3208, 3508, 3808.

Descriptors: *Catalysts, *Phenols, *Oxidation, *Kinetics, *Air pollution, Chemical reactions, Industrial wastes, Copper oxide, Waste treatment, *Waste water treatment, Order.
Identifiers: *Catalytic oxidation, Vapor-phase oxidation.

The vapor-phase oxidation of phenol at concentrations from 875 to 26 ppm (vol) over copper oxide on alumina was studied in a fixed-bed tubular reactor between 150 and 270 degrees C in the presence of 8.4 to 13.4 mol% water vapor. Catechol, hydroquinone, and organic acids, which are reported to form in appreciable quantities in the homogeneous oxidation of phenol, are not observed in the vapor-phase catalytic oxidation. Organic intermediates, probably o- and p-benzoquinone, occur in appreciable quantities in the catalytic oxidation at intermediate phenol conversions. At moderate temperatures (250 degrees) and low conversions (30%) approximately one-half of the phenol oxidized is converted completely to CO2 and H2O. This indicates that ring opening is a relatively difficult step in the reaction network. The vapor-phase oxidation is first order with respect to phenol over the range of conditions studied and exhibits an Arrhenius activation energy of 10 kcal/mol.
W74-07086

ACID NEUTRALIZATION DOESN'T COST MUCH,
Falconbridge Nickel Mines Ltd., Toronto (Ontario); and Acres Consulting Services, Ltd., Toronto (Ontario).
L. S. Rivett, and U. M. Oko.
Water and Waste Engineering, p B12-B16, March 1973. 4 tab.

Descriptors: *Waste water treatment, *Mine wastes, *Neutralization, Acid mine water, Capital costs, Operating costs, Limestones, Sulfur compounds, Sulfides, Heavy metals, Settling basins.
Identifiers: Mine tailings.

A major pollution problem associated with the mining and treatment of sulphide ores is the formulation of acids. The Falconbridge Nickel Mines, Ontario, has developed an effective program to neutralize acid and improve processing water quality at a modest investment and low operating costs. The initial problem arises when water comes in contact with the sulphide mineral pyrrhotite in processing causing small amounts of sulphur to dissolve forming a compound which eventually would oxidize into sulphuric acid. In developing its Strathcona mine and concentrator, the company faced two problems. The only available water source was inadequate; in addition Moose Lake water was already acidic, a result of earlier concentration operations. The solution was to utilize part of the lake both as a reservoir and an oxidizing basin. A dam and spillway were constructed to allow introduction of a continuous stream of finely ground limestone to neutralize acidity. The operation operates continuously and automatically producing a satisfactorily stream of good quality neutral water. Annual operating expenses average about $27,000, including $15,000 for limestone, $2,000 for power. Estimated cost of the plant, excluding building and dam costs, was 0.7 cents per 1000 gallons of water treated as compared to the over 10 cents treatment costs in much of North America. (Schroeder-Wisconsin)
W74-07124

COSTS OF WASTEWATER RENOVATION,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
R. Smith.
Available from the National Technical Information Service as PB231805, in $3.00 paper copy, $1.45 in microfiche. November 1971. 7 fig, 4 tab, 6 ref.

Descriptors: *Water treatment, *Water costs, *Water reuse, *Waste water treatment, Water supply, Design, Water distribution(Applied), Distillation, Demineralization, Reverse osmosis, Irrigation water, Industrial water, Potable water, Denitrification, Capital costs, Operating costs, Maintenance costs.

The economic feasibility of using renovated waste water to supplement raw water sources is examined. The first element considered is the total cost of water supplies from traditional sources. Operating, maintenance and capital costs are estimated to provide 1, 10, and 100 mgd supply requirements. Waste treatment costs are estimated to handle the discharge of waste water back into the environment. Operating and capital costs are also estimated for various waste water renovation processes to supply 1, 10, and 100 mgd requirements. The cost of such treatment is dependent on the uses to which the water will be applied. For example, some agricultural uses may be able to use secondary effluent. In general, waste water renovation may represent higher costs than water from normal sources. Waste water renovation, however, compares favorably with the development of new sources of raw water. Costs of these new sources are estimated under the Texas Water Plan, for the Metropolitan Water District of California, and for the City of Los Angeles. (Schroeder-Wisconsin)
W74-07141

WATER TREATMENT APPARATUS,
A. Wikey.
U.S. Patent No. 3,769,196, 3 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1841, October 30, 1973.

Descriptors: *Patents, *Aeration, *Sterilization, *Electrolysis, *Pollution abatement, *Waste water treatment, Biochemical oxygen demand, Bacteria, Equipment, Water pollution treatment, Industrial wastes.

An electrolysis unit uniquely suited for treating water by sterilization and aeration, comprises at least one pair of electrodes placed in juxtaposed position and being oppositely polarized. The polarization is periodically reversed to prevent residual build up on the plates. By simple modifications and by increasing the number of electrodes the unit may be used to treat water in flowing streams, lakes, ponds, aquariums, beach sections, in private homes, or in industrial plants. (Sinha - OEIS)
W74-07196

PROCESS OF SEPARATION OF EMULSIFIED OR DISPERSED MATTER FROM WATER,
E. H. Baer.
U.S. Patent No 3, 769,207, 3 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 915, No 5, p 1843, October 30, 1973.

Descriptors: *Patents, *Waste water treatment, *Flotation, Sludges, Pollution abatement, Water pollution control, Water quality control, Equipment, Facilities, Emulsions, Suspended solids, Separation techniques.
Identifiers: Suction jets.

A chamber is adapted for flotation of impurities and production of floating sludge on and above the surface of the water within the chamber. A knife edge is situated above the water level, and parallel to it. The knife edge is adapted to sever that part of the floating sludge which extends above the water surface. A movable suction jet situated above the knife, moves in unison with the knife edge and pneumatically removes the severed sludge without disturbing the water surface. (Sinha - OEIS)
W74-07197

PLASTIC MOVING-SURFACE TREATMENT OF SEWAGE,
Biospherics, Inc., Rockville, Md. (assignee).
G. V. Levin.
U.S. Patent No 3,779,906, 5 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 917, No 3, p 1086, December 18, 1973.

Descriptors: *Patents, *Sewage treatment, *Activated sludge, *Microorganisms, Pollution abatement, Water pollution control, Water quality control, Phosphates, Nutrients, Organic matter, Polymers, Plastics, *Waste water treatment.

Influent sewage is mixed with activated sludge providing a mixed liquor which is aerated in the presence of a quantity of particles of synthetic plastic. The added surface attracts microorganisms and the nutrients and organic matter necessary for their growth. The mixture is settled and subsequently the clarified liquid is removed while part of the sludge is recirculated along with the plastic particles. The plastic particles range in size from 0.05 to 1.0 mm in diameter and have a specific gravity ranging from about 0.9 to 1.3. Before recycling the sludge it may be passed to a phosphate-stripping zone. The microorganisms in the sludge release phosphate thus providing a phosphate enriched supernatant liquor. (Sinha - OEIS)
W74-07198

METHOD OF AND APPARATUS FOR THE PURIFICATION OF WATER CONTAINING ORGANIC CONTAMINANTS,
Laboratorium fuer Adsorptionstechnik, G.m.b.H., Frankfurt am Main (West Germany). (assignee).
W. Wisfeld, H. Wirth, W. Lotz, and A. Kratz.
U.S. Patent No 3,779,909, 5 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 917, no 3, p 1086, December 18, 1973.

Descriptors: *Waste water treatment, *Patents, *Water purification, *Oxygenation, *Filtration, *Chlorination, Water treatment, Water quality control, Activated carbon, Equipment.

Ground or surface water containing unwanted organic matter is fed into a trickle tower. After being subjected to an oxygen containing gas stream, it is passed through an activated carbon filter system. The effluent is then treated with at least 0.05 mg/liter of chlorine or with an equivalent disinfectant. (Sinha - OEIS)
W74-07199

FLUOROCARBON AND OXYGEN-PROVIDING COMPOUND TREATMENT OF WASTE WATERS,
M. G. Hicks.
U.S. Patent No 3,781,200, 3 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 917, No 4, p 1415, December 25, 1973.

Descriptors: *Patents, *Waste water treatment, Oxygenation, Pollution abatement, Water quality control, Water pollution treatment, Solvents, Ozone, Bubbles.
Identifiers: *Fluorocarbon, *Fat, *Freon, Oxygen compounds.

Heavy Freon is used as a solvent to remove fat from waste water. Freon is mixed with at least one oxygen containing compound selected from the group hydrogen peroxide, ozone, oxygen and air. The mixture is delivered into the wastewater and oxygen is diffused upward through the water in the form of bubles. The Freon containing the fat is continuously drawn off and taken to the next stage where the fat and Freon are separated so that the Freon can be used again. (Sinha - OEIS)
W74-07200

APN ARATUS FOR SEPARATING OIL AND SOLIDSFFRM M WATER,
Black, Sivalls and Bryson, Inc., Oklahoma City, Okla. (Assignee)
F. J. Barra, and K. R. Murrell.
U.S. Patent No 3,784,010, 5 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 918, No 2, p 679, January 8, 1974.

Descriptors: *Patents, *Filtration, *Waste water treatment, *Oil pollution, *Suspended solids, Pollution abatement, Water pollution control, Water quality control, *Separation techniques, Equipment.

A closed vessel is divided by a vertical partition. A second vertical partition is disposed within the lower portion of the first compartment dividing it into two separate filter areas each having a filter bed. An inlet water conduit extends within the first compartment and a pair of slotted water distribution conduits are positioned horizontally with the filter area. The conduits are connected to the inlet water conduit. Filtered water outlets are disposed in the bottom part of the second compartment. A backwash pump is connected to the conduit and valves control the flow of filtered water from the first to the second compartment. Backwash water flows from the second compartment separately to the filter area of the first compartment, through the filter beds and out of the first compartment by way of the slotted inlet water distribution conduits. (Sinha - OEIS)
W74-07202

SYSTEM AND METHOD FOR SEPARATING HEAVIER AND LIGHTER COMPONENTS OF LIQUID MIXTURES,
Esso Production Research Co., Houston, Tex. (assignee).
J. A. Garcia.
U.S. Patent No 3,784,468, 2 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 918, No 2, p 790, January 8, 1974.

Descriptors: *Patents, *Flotation, Gases, *Aeration, *Oil pollution, *Waste water treatment, Pollution abatement, Water quality control, Water pollution control, Cyclones, *Separation techniques, Equipment.
Identifiers: *Gravity separation.

The method and system for separating the components of a liquid mixture in which cyclones are used to force gas into the mixture for the purpose of aiding in floating the lighter component in a specially provided flotation cell or series of flotation cells is disclosed. The misture of liquids (oil and water) is delivered by conduit to a cyclone by means of a pump. The bottom of the cyclone is positioned in the gas environment. The vortex formed in the center of the cyclone sucks gas up to mix with the swirling liquid under pressure. The rising gas floats oil and possibly light solids to the surface of the liquid. The floated oil and solids overflow into a trough and are led away through a duct. The heavier liquid is pumped through a conduit into another cyclone where the mixing and charging with gas is repeated. (Sinha - OEIS)
W74-07203

WATER PURIFICATION APPARATUS,
Walter Dorwin Teague Associates, New York. (assignee).
J. E. Ryan, and S. Gollin.
U.S. Patent No 3,785,490, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1056, January 15, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, *Aeration, *Froth flotation, *Water purification, *Suspended solids, Water pollution control, Water quality control, Equipment.

A pump is used to deliver influent from a storage reservoir into a froth flotation tank. The pump is subject to intermittent air-binding thereby introducing air into the influent prior to its delivery to the froth flotation tank. The reservoir receives influent at a substantially constant rate lower than the pump capacity so that the pump has a tendency to intermittently air-bind. This results in a large amount of extremely fine air bubbles being introduced into the influent to cause the formation of a froth which rises to the surface carrying with it suspended solids. (Sinha - OEIS)
W74-07209

WATER PURIFICATION SYSTEM,
Delro, Inc., New Castle, Del. Assignee.
L. E. Huffman.
U.S. Patent No 3,786,924, 6 p, 1 fig, 8 ref; Official Gazette of the United State Patent Office, Vol 918, No 4, p 1438, January 22, 1974.

Descriptors: *Patents, *Waste water treatment, *Water quality control, *Water purification, *Reverse osmosis, Membranes.

A water purification system consists of a reverse osmosis unit having a feed water inlet, a permeate outlet, and a membrane structure between the feed water inlet and the permeate outlet. The reverse osmosis unit also has a concentrate outlet upstream from the membrane structure in fluid communication with the feed water inlet. There is a conduit for delivering raw water from a supply source to the feed water inlet, and a pump in the conduit for establishing a pressure responsive device for activating and deactivating the pump in response to preselected levels of vessel pressure. (Sinha-OEIS)
W74-07213

FOAM FLOTATION CONCENTRATION OF SEWAGE,
FMC Corp., San Jose, Calif. Assignee.
E. H. Brink, and W. G. Palmer.
U.S. Patent No 3,787,316, 6 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 918, No 4, p 1535, January 22, 1974.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Aeration, *Activated sludge, *Flotation, *Anaerobic digestion, Water quality control, Water pollution control, Bubbles, Foaming.

Raw sewage is subjected to primary settling, aeration and secondary settling to produce activated sludge. Part of the activated sludge from secondary settling is returned for aeration and part is wasted. Sludge from primary settling is delivered to an anaerobic digester. The wasted activated sludge is concentrated and a partially clarified effluent is derived from it. The concentrated waste sludge is introduced into the anaerobic digester. The innovation comprises the steps of diffusing a water foam of surfactant-stabilized air bubbles into the wasted activated sludge before the latter enters the concentrator. The wasted activated sludge is concentrated by the lifting action of the air bubbles to form a blanket. The blanket is then skimmed off for delivery to the digester. (Sinha-OEIS)
W74-07214

WASTE WATER PROCESS TANK CONTROL FACILITY,
Carter (Ralph B.) Co., Hackensack, N. J. Assignee.
W. O. Boschen, and O. A. Grieshaber.
U.S. Patent No 3,788,472, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1847, January 29, 1974.

Descriptors: *Patents, *Waste water treatment, *Pollution, abatement, Water pollution control, Water quality control, Sensors, Equipment, *Control systems.

The invention comprises a control box containing a control system having suitable relays and other elements and a panel with indicators mounted thereon which may be located in the control box or removed thereform. Suitable sensors are located in critical portions of the system and the sensors are electrically connected to the control box to actuate indicators which are mounted on the panel and to aid in the localizing of trouble and the correcting of such trouble. Some of the sensors may also function as control devices and/or indicators during normal (nonmalfunction) operation. The control system shuts operation down on malfunction and controls the operation of the treatment system in its normal (automatic) condition or in a temporary condition after malfunction. (Sinha-OEIS)
W74-07216

SEWAGE TREATMENT SYSTEM,
D. F. Othmer.
U. S. Patent No 3,788,476, 8 p, 9 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1848, January 29, 1974.

Descriptors: *Patents, *Sewage treatment, *Wastewater treatment, *Oxygenation, Sedimentation, Pollution abatement, Water pollution control, Water quality control, Chemical reactions, Aerobic treatment, Atmospheric pressure, Sludge, *Solids contact processes.

A conventional solids-liquid contactor clarifier with some additions provides means for: (a) addition of air or purer oxygen to sewage waters; (b) pressurizing the sewage water up to 10 atmospheres to increase solubility and concentration of oxygen - hence velocity of chemical and/or aerobic reaction; (c) withdrawing and depressurizing the sewage water to atmospheric pressure to allow most of dissolved gases to be released and to be discharged because of lower solubility for gases at atmospheric pressure; (d) recycling the sewage

water for from 2 to 50 times through this pressurizing-depressurizing cycle; and, when used aboard ship, (e) means for installation in the ship's hold to minimize effects of the ship's movements on the sedimentation operation. It is particularly useful for smaller installations, for use on ships, and other places where waste from not more than several thousand people is to be handled. It also may be used as a sedimentation system alone wherein insoluble solids are settled out to give a clear effluent. The sludge solids produced in an earlier sedimentation, either with or without oxidation, may be oxidized and sedimented in a separate step in the equipment. (Sinha-OEIS)
W74-07217

TREATMENT APPARATUS,
L. S. Love.
U. S. Patent No 3,788,477, 8 p, 22 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1849, January 29, 1974.

Descriptors: *Patents, *Aeration, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Equipment, Sludge.
Identifiers: *Clarifiers.

An aeration or mixing basin and a clarifier are formed as one integral unit, separated by a baffle. Flow from the aeration basin into the clarifier is limited by flow control plates. The clarifier has a bottom which slopes toward the aeration basin bottom, so that solids settling in the clarifier flow down the clarifier bottom towards the aeration basin, where they are picked up by circulation in the earation basin and re-suspended. A sludge scraper scrapes the clarifier bottom periodically to dislodge sludge to the bottom, and a scum skimmer skims the clarifier surface periodically to remove scum. (Sinha-OEIS)
W74-07218

WASTE WATER TREATMENT,
Shell Oil Co., New York. Assignee.
W. E. Savage.
U. S. Patent No 3,788,478, 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1849, January 29, 1974.

Descriptors: *Patents, *Waste water treatment, *Froth flotation, Pollution abatement, Water pollution control, Water quality control, *Aeration, Equipment, Bacteria, Activated sludge, *Biological treatment.

The apparatus for biologically treating aqueous organically contaminated waste consists of an aeration basin in which an open-topped flotation cell is submerged. Separation of the bacterial suspension and recovery of clarified effluent takes place within the aeration zone. The froth formed in the flotation unit is immediately emitted into the surrounding bacterial suspension. As the bubbles of the froth rise, they carry the suspended particles of activated sludge upward for removal. (Sinha-OEIS)
W74-07219

AGITATING AND AERATING APPARATUS,
Xodar Corp., Warwick, R. I. Assignee.
R. L. Clough, Jr.
U. S. Patent No 3,788,616, 7 p, 8 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1885, January 29, 1974.

Descriptors: *Patents, *Waste water treatment, *Aeration, *Pollution abatement, Water pollution control, Water quality control, Equipment.

A see-saw action is produced by a body that is pivotally mounted in the liquid with its pivot located intermediate of its ends. Air is fed to the lower side of the body. The body is adapted to trap alternately at each end enough air to cause that end to rise in the liquid. Trapped air is released when the end has risen a predetermined amount with the result that the body oscillates and agitates as it aerates the surrounding liquid. (Sinha-OEIS)
W74-07221

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
Available from the National Technical Information Service as PB-231 797, $4.75 in paper copy, $1.45 in microfiche. Water Resources Scientific Information Center Report WRSIC 74-204, April 1974, 131 p.

Descriptors: *Ozone, *Bibliographies, *Water treatment, *Waste water treatment, Water reuse, Chlorination, *Disinfection, *Oxidation, Potable water, Public health, Tertiary treatment, Viruses.

This report, containing 89 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising Selected Water Resources Abstracts (SWRA). At the time of search for this bibliography, the data base had 65,916 abstracts covering SWRA through December 15, 1973 (Volume 6, Number 24). Author and subject indexes are included.
W74-07251

HYDROGEN PEROXIDE CURES FILAMENTOUS GROWTH IN ACTIVATED SLUDGE,
District of Columbia Dept. of Environmental Services, Washington.
C. A. Cole, J. B. Stamberg, and D. F. Bishop.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-033, $0.65; microfiche from NTIS as PB-231 848, $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-033, October 1973. 20 p, 8 fig, 13 ref. EPA Project 11010 FYM. 14-12-818.

Descriptors: *Activated sludge, *Waste water treatment, *District of Columbia, *Sphaerotilus, Biological treatment, Aerobic bacteria, Sedimentation, Sewage bacteria, Sludge treatment.
Identifiers: *Hydrogen peroxide, *Biochemical treatment, Bulking, Washington(D.C.).

Laboratory tests at the Dupont Experimental Station substantiated by tests at the EPA-DC Pilot Plant in Washington, D.C. revealed that H2O2 offered a solution to filamentous bulking caused by Sphaerotilus growth. The addition of H2O2 eliminated the free-growing filaments while not deteriorating the spherical aerboic floc. The H2O2 also released oxygen which was beneficial in maintaining a purely aerobic environment. Bulking activated sludge units could be brought under control by doses of H2O2 from 20-200 mg/l for less than one to several days. The sludge volume index of the systems was reduced substantially. The H2O2 treated aeration process could then be brought under control by maintaining proper plant operation. (EPA)
W74-07253

REGENERATION OF CHROMATED ALUMINUM DEOXIDIZERS, PHASE I REPORT,
Boeing Commercial Airplane Co., Seattle, Wash.
H. C. Hicks, and R. A. Jarmuth.
Copy Available from GPO Sup Doc as EP1.23:660/2-73-023, $1.95; microfiche from NTIS as PB-231 835, $1.45. Also available from NTIS as PC$5.00. Environmental Protection Agency, Technology Series Report, EPA-660/2-73-023, December 1973. 160 p, 45 fig, 15 tab, 20 ref. EPA Project 12070 HEK.

Descriptors: Chromium, *Electrolysis, Toxicity, Metals, *Water reuse, Filtration, Centrifugation, Volumetric analysis, Recycling, *Waste treatment, *Oxidation, Reclamation, Industrial wastes. Identifiers: Aluminum deoxidizer reuse, Chromated deoxidizers, *Chromium reoxidation, *Regeneration, Hexavalent chromium, Trivalent chromium, Dissolved metals removal, Diffusion diaphragm, *Metal finishing waste treatment, Electrolytic reoxidation.

In the metal finishing industry highly concentrated hexavalent chromium solutions are used extensively to deoxidize aluminum surfaces prior to anodizing, conversion coatings, prepaint preparation, welding and adhesive bonding. A regeneration process was conceived and tested to reduce the frequency of discarding the spent chromated deoxidizers. The engineering techniques developed in this project involve reoxidation of trivalent chromium to the hexavalent state by electrolysis thru a diaphragm plus removal of undesirable dissolved metals by crystallization and separation. Results of the accomplished work establish that regeneration of chromated aluminum deoxidizers is feasible, practical and economical. (EPA)
W74-07254

COMBINED SEWER OVERFLOW SEMINAR PAPERS.
Edison Water Quality Research Lab., N.J.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-077, $2.20; microfiche from NTIS as PB-231 836, $1.45. Also available from NTIS as PC$5.75. Environmental Protection Agency Report No. EPA-670/2-73-077, November 1973. 216 p.

Descriptors: *Combined sewers, *Overflow, Management, Control systems, *New York, *Pollution abatement, Storm water, Design, Economics, Costs, *Storm runoff, Sewers, *Waste water treatment, Regulation.
Identifiers: Wet-weather flow.

The Environmental Protection Agency in conjunction with the New York State Department of Environmental Conservation conducted three one-day seminars on the problem of wet-weather flow pollution abatement. Many facets of the problem were considered including a brief overview of its magnitude and what the federal government is doing to manage and control this source of pollution. Various management, control, and treatment techniques were described and the most up-to-date information on design and economics was presented. The audience consisted of consulting and municipal engineers from all areas of New York State. This publication is a compilation of the papers presented at the seminar. (See W74-07256 thru W74-07256) (EPA)
W74-07255

STORMFLOW POLLUTION CONTROL IN THE U.S.,
Edison Water Quality Research Lab., N.J.
R. Field, and A. Tafuri.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 1-47, 22 fig.

Descriptors: *Storm water, *Storm runoff, Combined sewers, *Overflow, *Pollution abatement, Water pollution sources, Water quality control, Standards, Discharge(Water), *Waste water treatment, Treatment facilities, Equipment, Methodology, *Federal government.

The problem of storm water discharges and combined sewer overflows is discussed in relation to the Federal Government's involvement. This overview details wet-weather flow pollution as classified in the categories of combined sewer overflows, storm water discharges, and non-sewered runoff. As a result of program research, development, and demonstration projects, it is maintained that sewer separation in most cases is not the logical course of action for pollution abatement. Therefore the following approaches are being ex-

plored: control, treatment, and combinations of the two. These approaches are discussed under the topics of flow regulation, storage, porous pavement, new sewer systems, auxiliary biological treatment, microscreening, flotation, filtration separation, flow measurement, and management models, as well as the necessary equipment and instrumentation involved. In view of the tremendous quantities of pollutants bypassed during rainfall from the combined sewer system, it is not reasonable to debate whether secondary treatment plants should be designed for high BOD or suspended solids removal, since bypassing at regulators during wet-weather flow occurs. Rather, wet-weather standards must be instituted at various regulatory levels. (See also W74-07255) (Sandoski-Franklin)
W74-07256

PREVENTION AND CONTROL OF INFILTRATION AND INFLOW,
American Public Works Association, Chicago, Ill.
R. H. Sullivan.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 49-56.

Descriptors: *Infiltration, Documentation, *Reviews, Surveys, Economic justification, *Water pollution control, *Inflow, Methodology, Instrumentation, Pollution abatement, Combined sewers.

Some of the major findings of an APWA Foundation report bearing the same title are reviewed together with guidelines for the establishment of a survey to determine the nature and extent of infiltration and some of the factors to be used in making an economic analysis of desirable corrective actions. Steps involved in the complete infiltration-inflow analysis are outlined. Detection methods, equipment, and economic justification with respect to controlling pollution are disclosed. (See also W74-07255) (Sandoski-Franklin)
W74-07257

COMBINED SEWER OVERFLOW REGULATOR FACILITIES,
American Public Works Association, Chicago, Ill.
R. H. Sullivan.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 57-63.

Descriptors: *Storm water, Water pollution sources, Sewers, Water quality control, *Waste water treatment, Equipment, *Combined sewers, *Overflow, *Treatment facilities, *Regulation.

Results of investigative programs in such fields as the pollution of stormwater, the extent of combined sewer facilities, the design, operation, and maintenance of combined sewer overflow regulators, and the prevention and correction of excessive infiltration and inflow to sewers show that storm water is polluted whether or not it is carried in separate or combined sewers. Thus, to meet receiving water quality standards, treatment or control facilities may be necessary and therefore such equipment must be examined. Decision guidelines are presented for the consideration of the combined sewer overflow regulator facility as a possible means for pollution abatement. (See also W74-07255) (Sandoski-Franklin)
W74-07258

PRESSURE SEWERS,
New York State Dept. of Environmental Conservation, Alabany. Environmental Quality Research and Development Unit.
I. G. Carcich.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 65-87, 9 fig, 4 tab, 6 ref.

Descriptors: *Plastic pipes, Investigations, *Waste water treatment, *Combined sewers, Treatment facilities, Evaluation, Pumping, Performance, Operation and maintenance, *Sewers.
Identifiers: *Pressure sewers, Grinder pumps.

The pressure sewer concept deals with a wastewater collection system that utilizes a newly developed grinder pump unit and small diameter plastic or metallic piping systems. Results of a 13-month study undertaken to evaluate the functional specifications of the pumping units and to gain operating experience on the mechanical performance, use pattern, operating cost, and maintenance requirements for said units, are reported. A description of the grinder pump unit and the test results are given. Results indicate used plastic pipes and fittings functioned well for the duration of the demonstration project. It is recommended that pressure sewer systems be considered as available engineering technology for use where applicable. (See also W74-07255) (Sandoski-Franklin)
W74-07259

APPLICATION OF MICROSTRAINING TO COMBINED SEWER OVERFLOW,
Crane Co., King of Prussia, Pa. Cochrane Div.
G. E. Glover.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 89-113, 7 fig, 2 tab.

Descriptors: *Combined sewers, *Overflow, Performance, Investigations, Suspended solids, Flow rates, Treatment facilities, Organic matter, Coliforms, *Storm water, *Waste water treatment.
Identifiers: *Microstrainers.

Studies initiated to determine the performance of microstrainers in removing suspended solids are reported. A flow rate of 2.0 cfs/acre was used as the required instantaneous capacity of the treatment facility. A drawing of the microstrainer tested as well as a description of the operational procedure are given. Test results indicate that the microstrainer will reduce suspended solids from 50-700 mg/liter to 40-50 mg/liter at flow rates of 35 to 45 gpm/sq ft of gross submerged screen area (42-54 gpm of unimpeded submerged area). These flow rates have been routinely achieved within an arbitrary limitation of 24 inches of water differential between inlet and outlet liquid levels. The removal of organic and other oxygen demanding material is 25-40 percent confirmed by BOD, COD, and TOC measurements. Microstraining had negligible effect on the coliform content of the storm water. (See also W74-07255) (Sandoski-Franklin)
W74-07260

HIGH-RATE MULTI-MEDIA FILTRATION,
Environmental Protection Agency, New York. Region II.
P. Harvey.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 115-128, 10 fig.

Descriptors: Evaluation, Performance, Application methods, *Filtration, *Combined sewers, *Overflow, Treatment facilities, Screens, Filters, Optimization, *Construction costs, *Operating costs, Tertiary treatment, Automation, Operation and maintenance, Efficiencies, *Ohio, *Waste water treatment.
Identifiers: *Cleveland(Ohio).

To evaluate the applicability and effectiveness of the high rate filtration process in removing contaminants from combined sewer overflows, a testing program was undertaken at Cleveland, Ohio's Southerly Wastewater Treatment Plant, beginning in 1970. The two major process units used in the proposed treatment system were the drum screen followed by the deep bed, dual media filter. The testing program was conducted in two phases: (1) evaluation and selection of system media and filtration rates; and, (2) optimization of the filtration process via coagulants and polyelectrolyte addition prior filtration. Estimated total construction costs of a filtration plant which discharged waste screenings and filter backwash to the municipal treatment system ranged from $830,000 for the 35 mgd capacity to $3.754 million for 200 mgd capacity at a design rate of 24 gpm/sq ft. Annual cost estimates ranged from $97,270 to $388,210. High treatment efficiencies, automated operation, and limited space requirements are the principal advantages of the proposed system. The high rate filtration process was also evaluated elsewhere, in terms of its capacity for polishing secondary effluent. Test data confirmed the applicability of this media to reducing suspended solids, BOD, and phosphate to low residuals. (See also W74-07255) (Sandoski-Franklin)
W74-07261

SCREENING/DISSOLVED-AIR FLOTATION TREATMENT OF COMBINED SEWER OVERFLOWS,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
M. K. Gupta, and R. W. Agnew.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 129-151, 3 fig, 7 tab, 4 ref.

Descriptors: *Combined sewers, *Overflow, Treatment facilities, *Waste water treatment, *Flotation, Design criteria, Automation, Operation and maintenance, Equipment, Capital costs, Operating costs, Laboratory tests, Pilot plants, Evaluation, Performance, Suspended solids, *Separation techniques, *Wisconsin.
Identifiers: Screening/dissolved-air flotation, *Racine(Wis).

A major portion of the pollutional substances in combined sewer overflows is particulate in nature indicating that an efficient solid/liquid separation process can be expected to provide an effective treatment. Thus an effective and economical separation process was designed, tested, and developed on a full-scale basis. Two full-scale screening/dissolved-air flotation systems have been installed in Racine, Wisconsin for treatment of combined sewer overflows. Design criteria for each of the various elements is tabulated; systems were designed for completely automatic startup, operation, and shutdown. To insure optimum use of the system, a floodgate was installed in one of the overflow sewers to provide approximately 600,000 gallons of in-system storage. In addition, the system has been equipped to be completely self-draining thus enabling use of the system during periods of snowmelt and cold weather. The cost of the Racine system is $30,000 per mgd installed capacity. (See also W74-07255) (Sandoski-Franklin)
W74-07262

HIGH-RATE DISINFECTION OF COMBINED SEWER OVERFLOW,
Crane Co., King of Prussia, Pa. Cochrane Div.
G. E. Glover.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 153-170, 3 fig, 15 ref.

Descriptors: *Disinfection, *Combined sewers, *Overflow, *Waste water treatment, Water pollution control, Flow rates, *Pilot plants, Chlorine, Turbulence, Design criteria, Treatment facilities, Bacteria.
Identifiers: Bacteria kill.

Work on disinfection of combined sewer overflows has been performed in pilot size contact chambers at a constant flow rate. A bacteria kill of 99.99 percent was achieved with chlorine dosages of 10 ppm in 120 seconds under a flow rate of 20 gpm. The chambers were designed to ensure that the hypochlorite was promptly and well mixed with stormwater as well as to ensure a high degree of small eddy turbulence in the passages of the contact chamber. The extraordinarily high kill rate of these chambers is attributed to the turbulence during contact time. The performance of the pilot units, the preliminary design scheme, and the plans of a 92 cfs chamber designed according to this scheme are detailed. The installed cost of such a chamber has been calculated at about $53,000 (in 1969 dollars). The inherent advantage of increased turbulence economically induced in this type of installation of enhance reaction rates makes the system applicable to many situations. (See also W74-07255) (Sandoski-Franklin)
W74-07263

THE SWIRL CONCENTRATOR AS A COMBINED SEWER OVERFLOW REGULATOR,
American Public Works Association, Chicago, Ill.
R. H. Sullivan.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 171-179, 2 fig.

Descriptors: *Combined sewers, *Overflow, *Waste water treatment, Capital costs, Construction materials, Operation and maintenance, Treatment facilities, Automation, Design criteria, Model studies, *Regulation.
Identifiers: *Swirl concentrator.

As a result of laboratory tests and mathematical modeling, significant portions of settleable and floatable solids can be removed from combined sewer overflows using a swirl concentrator. Advantages of this system include low capital cost, absence of primary mechanical parts, and construction with inert material; operation of the facility is automatically induced by the inflowing combined sewage so that operating problems will be infrequent. Consideration of the use of a swirl concentrator as a combined sewer overflow regulator facility requires evaluation of many factors. The following factors are discussed: hydraulic head differential, hydraulic capacity of collector sewer, design flow, dry-weather flow and interceptor sewer capacity, and amount and character of settleable solids. (See also W74-07255) (Sandoski-Franklin)
W74-07264

THE EPA STORMWATER MANAGEMENT MODEL: A CURRENT OVERVIEW,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. C. Huber, J. P. Heaney, and H. Sheikh.
In: Combined Sewer Overflow Seminar Papers, Environmental Protection Agency Report No. EPA-670/2-73-077, November, 1973. p 181-216, 21 fig, 6 ref.

Descriptors: Loads(Forces), *Combined sewers, *Storm water, Overflows, *Storm runoff, Urban runoff, *Mathematical models, Computers, *Simulation analysis, *Rainfall-runoff relationships, Drainage, Storage requirements, Model studies, *Pennsylvania.
Identifiers: *Lancaster(Penn).

The problem of loading by combined and separate storm sewer overflows on streams and other receiving waters has led to the development of a comprehensive mathematical computer simulation program that models quantity (flow) and quality (concentrations) during the total urban rainfall-runoff process. The present Storm Water Management Model (SWMM) is descriptive in nature and will model most urban configurations encompassing rainfall, runoff, drainage, storage-treatment, and receiving waters. It does not define nor determine any decisions for the system or consider alternative methods for efficient economic comparisons. An overview of the SWMM is presented by illustrating its use in Lancaster, Pennsylvania. Major revisions to the Model have been made to include urban erosion prediction, modeling of new treatment devices and biological treatment facilities, monitoring of significant pollution sources, flexibility in modeling new areas, new and improved cost functions for treatment and storage options, and a modest hydraulic design capability as well as minor programming changes and slight format revisions. (See also W74-07255) (Sandoski-Franklin)
W74-07265

LAND APPLICATION OF SEWAGE SLUDGE,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
T. E. Bates.
Environment Canada Research Report No. 1, September, 1972. 212 p, 1 tab, 566 ref. 71-4-1.

Descriptors: *Water reuse, *Bibliographies, *Land management, *Reviews, *Sewage sludge, *Farm management, Nitrogen, Nutrients, Application methods, Copper, Zinc, Cadmium, Nickel, Chromium, Lead, Viruses, *Sewage treatment, Sludge disposal, Pathogenic bacteria.

A literature review was undertaken to determine the extent of present knowledge for ecologically safe and agriculturally productive application of sewage sludges to farm lands. It was concluded that sludge is quite variable in solids and nutrient content from one sewage plant to another and also on a daily basis. Nitrogen is likely to control rates of sludge application which should be restricted to those needed for crop production, yet leaching of phosphorus into the groundwater is not expected to be a major problem controlling application rates. Reports indicate that the metals copper, zinc, cadmium, nickel, chromium, and lead are high in some sludges and may be cause for concern. Studies are reported on the survival of human and animal pathogens and viruses whose populations are reduced by anaerobic digestion and eliminated by heat drying. No information was found concerning the land application of sludges resulting from treating sewage with chemicals for the removal of nutrients. Little information is available on times and methods of sludge applications which will prevent or eliminate water contamination by erosion and runoff. (Sandoski-Franklin)
W74-07266

THE EFFECTS OF HOUSEHOLD SANITARY SYSTEMS ON EFFLUENT PHOSPHATE LEVELS,
Windsor Univ. (Ontario). Industrial Research Inst.
P. D. La Valle.
Environment Canada Research Report No. 2, March, 1973. 67 p, 15 fig, 8 tab, 18 ref. 72-5-14.

Descriptors: *Waste water treatment, *Phosphates, Sanitary engineering, *Septic tanks, *Sewers, Urban drainage, Urbanization, *Pollution abatement, Effluents, Canada, Data collections.

An outline is presented of work conducted to assess the variation of phosphate input to urban waterways from residential areas serviced by septic tanks and sanitary systems. Data were collected on the population density of each sample area and the amount of phosphorus in household detergents, as well as lawn and garden fertilizers. For a number of urban watersheds, the presence of household septic tank systems played a major role in determining stream phosphate concentrations accounting for 56-76 percent of the spatial variation in stream total phosphate levels and 61-77 percent of the spatial variation in orthophosphate levels. Rainfall and fertilizer usage inputs were also statistically significant but secondary to septic tank systems. Results suggest that if phosphate pollution abatement is to be practiced, a concerted effort should be made to serve all urban residential units by an integrated sewer system with subsequent phosphate removal at the wastewater treatment plant. Also septic tanks are not an efficient means of keeping excessive quantities of phosphates from local stream systems. (Sandoski-Franklin)
W74-07267

AEROBIC DIGESTION OF ORGANIC SLUDGES CONTAINING INORGANIC PHOSPHORUS PRECIPITATES: PHASE I,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
J. Ganczarczyk, and M. F. D. Hamoda.
Environment Canada, Research Report No. 3, June 1973. 71 p, 7 fig, 22 tab, 65 ref. 72-5-4.

Descriptors: *Waste water treatment, *Sludge digestion, Laboratory tests, *Aerobic treatment, *Activated sludge, Salts, *Phosphorus, Chemical precipitation, Aeration, Nutrients, Organic compounds, Carbons, Suspended solids.
Identifiers: *Aerobic digestion, Total organic carbon, Soluble nutrients, Dewaterability, Settleability, Oxygen uptake, Volatile solids destruction, Ferric salts, Aluminum salts.

Three series of laboratory batch and semi-continuous experiments were carried out at 20C on the aerobic digestion of activated sludges containing aluminum salts or ferric salts used for phosphorus precipitation. Treatment responses measured were digested sludge characteristics, such as volatile solids destruction, oxygen uptake, settleability, and dewaterability, and supernatant characteristics, including total organic carbon, soluble nutrients, and suspended solids. The only variable that was controlled for all experiments was the sludge hydraulic detention time. The aerobic digestion of conventional activated sludge was not affected to any significant degree by the presence of ferric of aluminum precipitates. For both the control and chemically precipitated sludges an aeration period of 10 to 15 days was required for stabilization. Release of soluble organic carbon and nutrients during the aerobic digestion of activated sludges was not altered appreciably in the presence of the chemical precipitates. At the higher chemical dosages there was a reduction in nutrient release in the supernatant. Dewaterability and settling characteristics of control and chemically precipitated digested sludges did not differe significantly. (Sandoski-Franklin)
W74-07268

USE AND PRODUCTION OF IRON SALTS FOR PHOSPHORUS REMOVAL,
Waterloo Univ. (Ontario). Dept. of Chemical Engineering.
D. S. Scott.
Environment Canada Research Report No. 5, June, 1973. 62 p, 12 fig, 10 tab, 9 ref. 72-3-5.

Descriptors: *Salts, *Waste water treatment, *Phosphates, Chemical precipitation, Canada, Sulfates, Estimated costs, Iron compounds.
Identifiers: *Phosphate removal, *Iron sulfate, Sulfuric acid.

The principal objective was an assessment of the supply and probable cost of iron salts for use as phosphate removal chemicals in wastewater treatment. The use of iron salts for the precipitation of phosphate from wastewaters is discussed. Evidence is reviewed which suggests that ferrous and ferric salts behave in an equivalent manner due to rapid oxidation of the former in neutral solutions. A summary is given of the nature, source, composition, and reactivity with dilute sulfuric acid of major iron containing waste materials available in Ontario Canada. The costs of manu-

facture of ferrous and ferric sulfate at different production capacities from a number of these materials has been estimated. Treating costs for phosphate removal using iron sulfate could be as low as 10-20 dollars per million gallons. For almost all circumstances, the use of locally manufactured iron sulfates should be competitive with or cheaper than either alum of imported salts. (Sandoski-Franklin)
W74-07269

WASTE WATER TREATMENT IN COMMERCIAL FISH PROCESSING: REDUCING STICK WATER LOADINGS,
Wisconsin Univ., Madison.
D. A. Stuiber, and J. J. Quigley.
Available from the National Technical Information Service as COM-73-10/58, $3.00 in paper copy, $1.45 in microfiche. University of Wisconsin Sea Grant Advisory Report No. 1, WIS-SG-72-401, November, 1972. 17 p, 5 fig, 4 tab, 4 ref.

Descriptors: *Lake Michigan, *Waste water disposal, Liquid wastes, *Waste water treatment, *Commercial fish, Treatment facilities, Industrial plants, Suspended solids, Laboratory tests, Cost analysis, Coagulation, Design criteria.
Identifiers: Lime coagulation, *Glutaraldehyde coagulation, *Anaerobic-aerobic systems, Fish processing.

A wastewater disposal problem involving the inadequate treatment of wastewater resulting from the processing of alewives for fish meal was investigated. Inplant practice was examined to determine whether process revisions could be made to reduce the amount of lipids, protein, and other suspended solids in the discharge. A further processing step was developed to remove more solids and to increase product recovery. The resulting wastewater discharge was studied for purposes of improving treatment practice. Owing to the complexity of the material in the discharge, an anaerobic treatment stage was required with subsequent design focusing on combination anaerobic-aerobic systems. Laboratory scale studies on both glutaraldehyde and lime coagulation methods were made. Both processes were subjected to cost analysis with generally comparable results. Preliminary analysis conducted on waste water effluent indicated that resulting effluents had comparable chemical oxygen demand and biochemical oxygen demand values. (Sandoski-Franklin)
W74-07270

REMOVAL OF PHOSPHATES FROM WASTEWATERS WITH ELECTRO-CHEMICALLY GENERATED GADOLINIUM IONS,
Los Alamos Scientific Lab., N. Mex.
E. I. Onstott.
Available from the National Technical Information Service as LA UR 73-72 $3.00 in paper copy, $1.45 in microfiche. (1971) 10p, 3 fig, 3 tab, 6 ref (CONF-73 0402).

Descriptors: *Electrochemistry, Chemical precipitation, *Phosphates, Sewage effluents, Anodes, Cathodes, *Waste water treatment, Hydrogen ion concentration, Electrolysis, Zinc, Bicarbonates, *Ion transport.
Identifiers: *Phosphate removal, *Gadolinium.

A method of electroprecipitation of phosphates from secondary sewage effluents with anodically generated GD 3+ was investigated using a gadolinium metal anode and stainless steel cathode. At the anode Gd was oxidized to Gd3+, WHICH PRECIPITATED PHOSPHATES, AND AT THE CATHODE H2 gas was evolved. For electrolysis times in excess of theoretical, removal of soluble orthophosphate was greater than 99 percent to concentrations of about 0.02 mg/liter P; soluble condensed phosphate removal was more than 90 percent to about 0.04 mg/liter P; and removal of soluble organic phosphate was greater than 80 percent to about 0.07 mg/liter P. The electrolytic treatment increased the pH OF PRODUCT FILTRATES AND A FRACTION OF THE BICARBONATE WAS CONVERTED TO CARBONATE DEPENDING ON ELECTROLYSIS TIMES. Some Zn2+ and carbonate, if the concentration of carbonate exceeded 30 mg/liter, were precipitated by this electrolytic treatment. (Sandoski-Franklin)
W74-07271

CYANIDE WASTE TREATMENT UTILIZING CATALYTIC OXIDATION,
Thiokol Chemical Corp., Brigham City, Utah.
P. H. Woolhiser, and D. P. Clark.
Available from the National Technical Information Service as AD-769 293 $3.75 in paper copy, $1.45 in microfiche. Air Force Weapons Laboratory Report No. AFWL-TR-73-37, October, 1933. 82 p, 13 fig, 27 tab, 33 ref. 683M3W10 F29601-72-C-0135.

Descriptors: *Waste water treatment, *Oxidation, Liquid wastes, Effluents, Evaluation, Standards, Effluent streams, Design criteria, Operating costs, Industrial wastes, Treatment facilities.
Identifiers: *Electroplating, Photographic processing, *Catalytic oxidation, *Cyanides.

Two major sources of liquid cyanide wastes are electroplating operations and color photograph processing. Waste streams vary in concentration from under one mg/liter to over 100,000 mg/liter. To meet state effluent standards which range from 0.25 mg/liter to undetectable levels, a system utilizing a proprietary cobalt-based catalyst and chlorine-producing electrolytic cells was evaluated with actual photographic and electroplating wastes. A prototype catalytic oxidation system capable of treating 0.25 gpm of 2000 mg/liter total cyanide waste produced effluent streams containing undetectable amounts of cyanide with copper plating and nickel strip feeds. Treatment of photographic wastes produced an 87 to 94 percent reduction of total cyanide. Effluent cyanate levels were generally under 10 mg/liter for copper solutions and ranged from 4 to 42 mg/liter for nickel strip solutions. The catalytic oxidation system has a strong potential for decreasing the operation costs of cyanide destruction system. System designs are given for two full-scale cyanide waste treatment systems. (Sandoski-Franklin)
W74-07272

PHOSPHORUS REMOVAL TREATABILITY STUDIES AT C.F.B. BORDON, PETAWAWA, TRENTON AND UPLANDS,
Environmental Protection Service, Burlington (Ontario). Wastewater Technology Center.
E. E. Shannon, and R. J. Rush.
Environment Canada Technology Development Report EPS 4-WP-73-5, December, 1973. 34 p, 11 fig, 7 tab, 3 ref.

Descriptors: *Canada, Phosphorus, On-site tests, Efficiencies, Evaluation, *Waste water treatment, *Estimated costs, Environmental effects, *Treatment facilities, Lime.
Identifiers: *Phosphorus removal, Waste water characteristics, Diurnal variations, Treatment methods, Alum, Ferric chloride.

Results of phosphorus removal treatability studies carried out at Canadian Forces Bases Borden, Petawawa, Trenton, and Uplands during 1971 and 1972 are reported. Traditional phosphorus precipitants such as ferric chloride, alum, and lime, were evaluated with respect to phosphorus removal efficiency via standard jar testing procedures. Also the wastewater characteristics and diurnal variations at each Base were determined and discussed. Costs for phosphorus removal at each Base were estimated and recommendations made regarding the type of full-scale system that should be installed. The impact of the phosphorus removal system on the receiving waters was evaluated. (Sandoski-Franklin)
W74-07273

PURIFICATION OF EFFLUENTS AND IMPROVEMENT OF THE TECHNOLOGY IN THE PRODUCTION OF CHLORETONE, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Khimiko-Farmatsevticheskii Institut, Moscow (USSR).
G. A. Frangulyan, I. E. Sokolova, A. A. Lavrukhina, and E. V. Zyuzenko.
Khim Farm Zh. Vol 6, No 11, p 51-52. 1972.
Identifiers: *Chloretone, Effluents, Chemical analysis, *Waste water treatment, Water purification, Pollutant identification.

A method for purifying effluents from the production of 1,1,1, trichloro-2-methylpropanol-2 (chloretone) is described. An improvement in chloretone production is discussed. The purification is based on heating effluents with Ca soda to 95-100C. The data from chemical analyses of effluents prior to and after purification are included.--Copyright 1973, Biological Abstracts, Inc.
W74-07285

PLANNING AND OPERATIONAL STUDIES IN THE INTEGRATED USE OF DESALINATION. CASE STUDIES FOR CYPRUS AND JERSEY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 3A.
W74-07308

WATER AND EFFLUENT TREATMENT PLANTS - COST CONSIDERATIONS AND CLIENT, CONTRACTOR, CONSULTANT RELATIONSHIPS, THE CONSULTANT'S VIEW,
J. R. Joslin.
Process Biochemistry, Vol 9, No 1, p 10-11, January 1974. 3 fig, 3 ref.

Descriptors: Water resources development, *Waste water treatment, *Treatment facilities, *Costs, *Projects, *Design, *Optimization, Planning, Water quality, Civil engineering, Mathematical models, Systems analysis.
Identifiers: Great Britain.

With the reorganization of local government and the capital intensive water services industry at an advanced stage in England, it is desirable to examine the client-contractor-consultant relationship; the views of each are separately put in this series. This second article deals with the consultant's view. The effect of costs on projects carried out by consulting engineers from the feasibility study to the control of actual expenditure on the contract works is discussed in terms of achieving the economically optimal design consistent with sound engineering practice. As a plan is carried out, the main overall cost factors, i.e., repayment periods, running costs, choice and use of processes, must be assessed in greater detail. An optimization model can be used advantageously to obtain the most cost-effective treatment methods for meeting the desired standards. The control and certifying of actual expenditure is most important. (Bell-Cornell)
W74-07312

LAND DISPOSAL OF WASTEWATER--LITERATURE REVIEW FOR 1973,
New York State Dept. of Environmental Conservation, Albany.
T. J. Tofflemire, and F. E. Van Alstyne.
Technical Paper No 33, February 1974. 10 p, 129 ref.

Descriptors: *Waste water disposal, *Water spreading, *Irrigation, *Waste disposal wells, *Reviews, Bibliographies, Sprinkler irrigation, Sewage disposal, Waste water treatment, Septic tanks, Soil disposal fields.
Identifiers: *Land disposal(Wastes).

Recent literature in land disposal or treatment of waste water is reviewed. The most used wastewater application method was spraying, followed by flooding and ridge and furrow. Many municipal systems provide some form of secondary treatment before land application. In the United States in 1972, land disposal was used by 571 municipalities and 1300 industries. In addition, there were over 50 million people using septic tanks. The results of irrigating several crops with sewage effluent or with regulating irrigation water were compared. Significant increases in soil phosphate, sodium, soluble salts and pH were found in the sewage plots. Possible harmful plant responses with sewage irrigation include nitrogen overloading, heavy metal accumulation, boron toxicity, and salt accumulation in the soil. (Knapp-USGS)
W74-07327

THE IDENTIFICATION OF THE REACTION PRODUCTS FORMED BY THE OXIDATION OF AQUEOUS AMMONIA WITH POTASSIUM FERRATE VI,
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
G. W. Buttwin.
Available from the National Technical Information Service as PB-231 799 $5.50 in paper copy, $1.45 in microfiche. MSc Thesis, 1972. 38 p, 3 fig, 11 tab, 12 ref, 2 append. OWRR A-031-OHIO (1).

Descriptors: *Waste water treatment, *Oxidation, *Ammonia, Nitrogen, Chemical reactions, Sewage treatment.
Identifiers: Potassium ferrate.

An exploratory study was undertaken to determine the feasibility of using potassium ferrate VI to oxidize ammonia in the secondary effluent from water treatment plants. The method shows good potential in that the major oxidation product, elemental nitrogen, is also the most desired product considering pollution abatement. In the range 0.001 to 0.01 N NH3, an increase in concentration of ferrate increases the percent ammonia removed. Increases in the mole ratio of ferrate to ammonia above 1:1 decrease ammonia removal. In the pH range 8-9, an increase in pH increases ammonia removal. The addition of chloride ion up to 100 ppm has little effect on ammonia removal. Of the ammonia nitrogen oxidized, more than 50% is oxidized to elemental nitrogen and less than 10% is oxidized to nitrites. (Knapp-USGS)
W74-07333

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
M. M. Elsahragty.
Available from the National Technical Information Service as PB-231 831 $5.50 in paper copy, $1.45 in microfiche. Studies in the Analysis of Metropolitan Water Resource Systems, Vol IX, Technical Report No. 80, Water Resources and Marine Sciences Center, Cornell University, Ithaca, N.Y. February 1974 44 fig, 98 ref, 2 appen. OWRRC-3101(no. 368A) (5) an A-04z-NY(1).

Descriptors: *Waste water treatment, *Water quality control, *Linear programming, *Dynamic programming, *Simulation analysis, Computer models, Digital computers, Optimization, Cost analysis, Municipal wastes, Waste water disposal, Water management(applied), Methodology, Mathematical models, Systems analysis, *Cities.

A systems methodology for defining and evaluating alternatives for managing urban water quality is proposed. This study focuses on the planning and operation of urban wastewater control systems. The metropolitan economic-engineering urban water quality system is defined and an approach is adopted for analyzing the complex interactions among the physical, technological, social and economic aspects of the urban water management problem. Linear programming is utilized to define the minimum required investment in the wastewater control system. To account for risk, a chance constrained formulation is provided. Dynamic programming is used to obtain the optimal operating policy under deterministic and stochastic conditions. A water quality index was used to obtain this policy. The model relies on data collection systems that provide continuous information on the quality and quantity of both the receiving water and the wastes to be discharged. Digital computer simulation is utilized to predict the values of various measures of effectiveness of the water pollution control system and to check the validity of the mathematical programming solutions. The methodology is applied to a specific urban area. The data needs and computational effort are illustrated, and the possibility of improving the current planning and management procedures is discussed. The study illustrates how the system analysis framework is suitable for planning effective and economically efficient water pollution control programs and for the operation of wastewater control systems. (Bell-Cornell)
W74-07334

SYSTEMS SIMULATION OF THE EFFECT OF TERTIARY TREATMENT FOR CARBON, NITROGEN, AND PHOSPHORUS REMOVAL UPON PRIMARY PRODUCTIVITY, STANDING CROP, AND COMMUNITY STRUCTURE OF AUTOTROPHIC AND HETERTROPHIC COMMUNITIES IN RECEIVING MODEL STREAMS.
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-07337

MODULAR WASTEWATER TREATMENT SYSTEM DEMONSTRATION FOR THE TEXTILE MAINTENANCE INDUSTRY,
Linen Supply Association of America. Miami Beach, Fl. and Institute of Industrial Launderers Washington, D.C.
G. Douglas.
Copy Available from GPO Sup Doc as EP1.23:660/2-73-037, $3.45; microfiche from NTIS as PB-231 837 $1.45. Environmental Protection Agency, Technology Series EPA-660/2-73-037, January 1974. 342 p, 32 fig, 109 tab, 20 ref. EPA Project 12120 FYV.

Descriptors: *Waste water treatment, Coagulation, Diatomaceous earth, *Filtration, *Flotation, Industrial wastes, Water costs, Biochemical oxygen demand, Suspended solids, Laundering, Pollution taxes(Charges), Separation techniques, Operating costs, Textiles, *Flocculation.
Identifiers: *Chemical treatment; *Laundry effluent, Municipal sewer ordinances.

An industrial waste survey of the textile maintenance industry was performed to characterize and quantify the pollutants emanating from various types of plants. Bench scale waste treatment tests were performed to design a system for the textile maintenance industry. A wastewater treatment system consisting of chemical treatment and flocculation facilities, dissolved-air flotation for solids-liquid separation, diatomaceous earth filtration for polishing the flotation effluent, and vacuum filtration dewatering of flotation scum was installed at a commercial laundry. Data were obtained on effluent quality, sludge volume, chemical costs and other operating costs for industrial laundry wastewater, linen laundry wastewater, and uniform laundry wastewater. The final effluent of the linen and uniform laundry wastewater treatment met municipal sewer ordinance requirements for grease and heavy metals. Wastewater suspended solids and BOD were also significantly reduced, so that high municipal sewer surcharges would not be imposed. The effluent from the industrial laundry wastewater treatment did not consistently meet municipal sewer ordinance standards. Complete wastewater treatment operating costs were on the order of $0.80/cu m for industrial laundry wastewater, $0.66/cu m for uniform laundry wastewater and $0.40/cu m for linen laundry wastewater. It was concluded that the treatment system had applicability in treating laundry wastewater. (EPA)
W74-07343

ORGANIZATION OF THE COLLECTION AND DECONTAMINATION OF INDUSTRIAL AND DOMESTIC RADIOACTIVE SEWAGE, (IN RUSSIAN),
V. F. Bagretsov, S. I. Zakharov, and S. V. Metal'nikov.
Gig Sanit. Vol 37, No 12, p 91-93. 1972.
Identifiers: Collection, *Industrial wastes, Organization, *Radioactive sewage, Salts, *Sewage, Decontamination, *Waste water treatment, Waste disposal.

The 10-yr experience of the V. I. Lenin Research Institute of Atomic Reactors confirmed the possibility of complete protection of the environment against radioactive pollution by industrial wastes. This is promoted by centralization of the collection, treatment and monitoring of radioactive wastes at the Institute. The radioactive solutions at the Institute are divided into 3 groups according to specific activity and salt content. The first group consists of the saltfree waters of the first circuits of the reactors and holding basins; the second solutions obtained on deactivating the equipment, rooms, floors and waste products of chemical laboratories; the third, sanitary plumbing wastes.--Copyright 1973, Biological Abstracts, Inc.
W74-07362

USER CHARGES AND INDUSTRIAL COST RECOVERY, DENVER SMSA,
Wilbur Smith and Associates, Denver, Colo.
G. H. Aull, Jr., T. F. Jones, and W. G. Stringfellow.
Available from the National Technical Information Service as PB-231 866, $9.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Region VIII, Denver, Colorado, January 1974. 120 p, 2 fig, 52 tab, 42 ref. EPA Contract 68-01-1864.

Descriptors: *Pollution taxes(Charges), *Cost allocation, Use rates, Treatment facilities, Water rates, *Colorado, *Industrial water, *Regulation, Grants, Cost sharing, Cost repayment, Administrative agencies, Water pollution control, *Construction costs.
Identifiers: Waste water user charges, Industrial cost recovery, *Denver SMSA.

An investigation was made of the extent to which wastewater user charges, consistent with current federal regulations and guidelines, have been adopted by municipal and special district wastewater agencies within the Denver Standard Metropolitan Statistical Area. Compliance with these guidelines has been established as a prerequisite for award of federal construction grants for wastewater treatment facilities. Three wastewater agencies within the Denver SMSA were selected for more detailed analyses of current user charge schedules. The existing schedules of rates and charges were compared to schedules derived in the study through rational cost allocation and application of model user charge systems developed by Environmental Protection Agency. Volume, strength and flow rates are among the waste characteristics considered in developing cost allocations and revenue structure. Hypothetical examples were also developed to illustrate the possible impact of the industrial cost recovery features of federal regulations and guidelines upon local user charge schedules. A special inquiry was made into the state of eligibility for construction grants of regional wastewater treatment and disposal agencies in the light of revenue methods employed by their direct and indirect subscribers. Possible corrective actions were outlined. Previ-

ous study findings were reaffirmed that a number of wastewater agencies within the Denver SMSA have not established or maintained user characteristic and treatment cost data in a form or to the extent necessary to design equitable user charges, and thus fail to comply with current federal guidelines for eligibility for construction grants. (EPA)
W74-07370

MICROBIAL INDICATORS FOR THE BIOLOGICAL QUALITY OF TREATED WASTEWATER EFFLUENTS,
Dept. of Civil Engineering. Illinois Univ., Urbana.
E. O. Greening.
Available from the National Technical Information Service as PB-231 874, $9.50 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report. EPA 670/2-73-082, May 1974. 118 p, 7 fig, 9 tab, 127 ref. M.S. Thesis, 1971. EPA Project 17060 EYZ. Program Element 1BB043.

Descriptors: *Bioindicators, *Bacteria, Coliforms, *Yeasts, *Chlorination, *Waste water treatment, Viruses, Public health, Water reuse, Activated sludge, Trickling filters, Resistance, Sewage bacteria, E. coli.
Identifiers: Enteric viruses, Chlorine resistance, Pour plates, Acid-fast bacilli.

Due to the relatively low resistance of coliforms to chlorination when compared to resistant enteric pathogens such as viruses and protozoal cysts, a search was initiated for a new chlorine resistant bioindicator. The presently used indicator organisms and the reported chlorine resistance of wastewater organisms are reviewed. Wastewater effluents were chlorinated to a free chlorine residual and plated on various media at different temperatures. Surviving organisms were collected for further study. With this procedure the most chlorine sensitive organisms were eliminated from consideration. Pure cultures of 135 isolates were collected in this manner. A yeast and two different acid-fast bacteria were shown to be resistant to chlorination at levels considered necessary for the inactivation of pathogens, including viruses. One acid-fast bacteria was able to survive 2.0 mg/l free chlorine residual for 67 minutes while the other survived 1.0 mg/l free chlorine for 15 minutes. The yeast showed resistance to 1.0 mg/l free chlorine for 20 minutes. In comparison, a pure culture of Escherichia coli failed to survive following 5 minutes contact with 0.03 mg/l free chlorine. Techniques were investigated for the routine isolation of these organisms. Use of yeast extract-malt extract agar at pH 3.5 was employed for the yeast while acid-fast staining of colonies grown on membrane filters on Middlebrook and Cohn 7H10 agar was found to be useful for the acid-fast bacteria. (EPA)
W74-07372

ROTATING BIOLOGICAL DISK WASTEWATER TREATMENT PROCESS - PILOT PLANT EVALUATION,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
W. N. Torpey, H. Heukelekian, and A. J. Kaplovsky.
Available from the National Technical Information Service as PB-232 133, $6.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Report EPA-670/2-73-027, May 1974. 250 p, 22 fig, 41 tab, 5 ref. EPA Project 17010 EBM. Grant No. WP-01322-02.

Descriptors: *Waste water treatment, *Activated carbon, Absorption, *Nitrification, Pilot plants, *Biochemical oxygen demand, *Oxygenation, Slime, Nutrient removal, *Treatment facilities.
Identifiers: Oxygen enriched atmospheres, *Rotating disks, Surface loading, Illumination, Stage treatment, Nutrient extraction.

The results of operating a 10,000 to 20,000 gal per day staged rotating disk pilot plant have been presented for three modes of operation, namely, (1) the slimes in all stages exposed to ambient atmospheres, (2) the slimes in stage 1 exposed to an atmosphere enriched with oxygen, and (3) the slimes in stages 1 and 3 of a 3-stage operation exposed to atmospheres enriched with oxygen. In the first mode of operation about 30 minutes of contact with the slimes was sufficient to remove 90% of the B.O.D.5 while during the second mode of operation, 18 minutes accomplished the same rate of removal of B.O.D.5. In the third mode of operation, not only was 90% of the B.O.D.5 removed during 18 minutes of contact with the slimes but a substantial portion of the nitrogenous oxygen demand was satisfied. (EPA)
W74-07373

COMBINED SEWER OVERFLOW TREATMENT BY THE ROTATING BIOLOGICAL CONTACTOR PROCESS.
Autotrol Corp., Milwaukee, Wis. Bio-Systems Div.
Available from the National Technical Information Service as PB-231 892, $11.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-050, June 1974. 136 p, 69 fig, 8 tab, 9 ref. EPA program Element 1BB034. Contract 14-12-24.

Descriptors: *Waste water treatment, Treatment facilities, *Combined sewers, *Overflow, *Biological treatment, Water pollution treatment, Biochemical oxygen demands, Chemical oxygen demand, Solid wastes, *Wisconsin, Pilot plants.
Identifiers: *Biological contactor(Rotating), *Milwaukee(Wisc).

A Rotating Biological Contactor (RBC) was constructed on a bypass of a portion of the combined sewerage in Milwaukee, Wisconsin, to demonstrate the feasibility of treating combined sewer overflows. Prior to actual field testing of this full scale RBC unit, simulated overflow tests were conducted with a bench scale RBC system to establish scale-up criteria for costing out the full scale plant, operating parameters and test conditions for the demonstration facility. Construction of the demonstration plant was completed early in 1969, and a full year of testing was completed in March of 1970. Average dry weather flow through the plant was 35 gallons per minute (gpm). Under actual storm flow conditions, the demonstration plant exhibited system stability up to 14 times dry weather flow conditions. Beyond these conditions, COD treatment effectiveness sharply decreased ranging from no reduction at high flows to 79% reduction at normal dry weather flow. With lessening of these flows, biological treatment recovery was obtainable in 24 to 30 hours. To effectively treat these high overflow loads, sufficient volumetric storage and a solid separation operation should be provided to limit flow rates to controllable RBC treatment levels. (Tobin-EPA)
W74-07374

A COMPARISON OF EFFLUENT CHARACTERISTICS FROM CONVENTIONAL AND OXYGEN BLEACHING SEQUENCES: RESULTS OF A LABORATORY STUDY,
National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
W. L. Carpenter, W. T. McKean, H. F. Berger, and I. Gellman.
Preprints, 1973 International Pulp Bleaching Conference, June 3-7, 1973, Vancouver, B.C., p 13-19. 10 tab, 3 ref. (Jointly sponsored by TAPPI and CPPA).

Descriptors: *Bleaching wastes, *Waste water treatment, Waste treatment, *Pulp wastes, *Oxygen, *Biodegradation, *Effluents, Water pollution sources, Color, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Chlorides, Aerated lagoons, Hardwood, Softwood, Pollution abatement, Pulp and paper industry.
Identifiers: *Oxygen bleaching, Bleach plants.

Southern kraft softwood and hardwood pulps were bleached by conventional CEHDED and CEDED sequences in comparison with modern OCEDED and OCED sequences. (C = chlorine, E = alkaline extraction, D = chlorine dioxide, H = hypochlorite, O = oxygen). The respective bleach effluents were compared with regard to color, chloride and total solids contents, volatile vs fixed solids, BOD, COD, alkalinity, and other characteristics. Allowing for 100% recycle of the oxygen stage, softwood-derived effluents contained 81% less BOD, 67% less COD, 73% less chloride, and 89% less color than those from conventional bleach sequences. For hardwood-derived effluents, the respective decreases were 81% in BOD, 80% in COD, 44% in chlorides, and 92% in color. Reductions in total, volatile, and fixed solids ranged from 40 to 50% for both hard- and softwood pulp effluents. When simulated effluents from each bleaching stage were subjected to biodegradation in aerated stabilization basins, all underwent rapid BOD reductions, viz., 75-97%, during detention times of 1 to 10 days. (Brown-IPC)
W74-07375

OXYGEN BLEACHING -- A FLEXIBLE PROCESS FOR POLLUTION ABATEMENT,
Groupement de la Cellulose, Saint-Gaudens (France). Research Lab.
J. C. Lescot.
Preprints, 1973 International Pulp Bleaching Conference, June 3-7, 1973, Vancouver, B.C., p 61-70. 12 fig, 7 tab, 4 ref. (Jointly sponsored by TAPPI and CPPA).

Descriptors: *Waste water treatment, Pollution abatement, Water pollution control, *Bleaching wastes, *Pulp wastes, *Oxygen, *Effluents, Waste water pollution, *Color, Biochemical oxygen demand, Chemical oxygen demand, Water pollution sources, Pulp and paper industry, Europe, Hardwood, Industrial wastes.
Identifiers: Sapoxal(Oxygen bleach) process, France, Kraft pulp.

The production of fully bleached kraft hardwood pulp at the St. Gaudens mill of La Cellulose d'Aquitaine was scheduled for startup in mid-1973, using the 'Sapoxal' oxygen bleaching process. A preliminary study of factors affecting this operation with and without an oxygen bleaching stage is reported. Various effluent characteristics (notably color, BOD, and COD) were investigated as a function of the pulp's deligNification degree (kappa-number) and of soda losses from the pulping-bleaching system. The adoption of the oxygen bleach process is shown to achieve important reductions in the pollution load of the total mill effluent, notably in color (ca. 50%), as well as in BOD (ca. 31%), and in COD (ca. 17%). (Brown-IPC)
W74-07376

WATER REUSE AND RECYCLE IN THE D(C)EDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
J. A. Histed, and F. M. A. Nicolle.
Preprints, 1973 International Pulp Bleaching Conference, June 3-7, 1973, Vancouver, B.C., p 133-140. 4 fig, 4 tab, 10 ref. (Jointly sponsored by TAPPI and CPPA).

Descriptors: *Bleaching wastes, *Pulp wastes, *Waste water treatment, *Recirculated water, *Water reuse, *Discharge(Water), Chlorine, Temperature, Corrosion, Cooling, Sodium compounds, Chlorination, Chlorides, Chemical oxygen demand, Biochemical oxygen demand, Dissolved solids, Color, Canada, Pulp and paper industry.

Identifiers: Chlorine dioxide, Bleaching agents, Alkaline extraction, Sodium hydroxide, Washing(Pulp), Market pulp, Countercurrent washing.

When western softwood kraft pulps of high kappa-number (residual lignin content) are bleached by the D(C)EDED sequence (D = chlorine dioxide, E = alkaline extraction, C = chlorine), the volume of effluents from the acid and alkaline sewers can be lowered to 1685 U.S. gal per air-dry ton by extensive recycling of chlorination filtrate and by countercurrent washing of the bleached pulp. In order to maintain the brightness of market pulp at 91.5 (Elrepho spectrophotometer units), an extra 0.3% of chlorine dioxide (based on pulp weight) must be applied in the first chlorination stage. At normal chlorination temperature (25C), neither the viscosity nor the strength of the pulp suffered. A small loss in both qualities was noted upon treatment at 57C, possibly due to slow mixing and non-uniform chlorination. In practice, more rapid uniform mixing seems advisable, or else the temperature must be reduced by cooling the filtrated used on the first shower of the chlorination washer. Corrosion-resistant materials will be needed, since chloride concentrations reached 4-5 g/liter in the chlorination stage, 2.4 g/liter in the first extraction stage, and 1.7 g/liter in the first chlorine dioxide stage. Countercurrent washing and recycling of chlorination filtrate also reduced the effluent's pollution load by 30% for COD, 40% for 5-day BOD, 25% for dissolved solids, and 40% for color. (Brown-IPC)
W74-07377

THE EFFLUENT-FREE BLEACHED KRAFT PULP MILL. PART V. THE R4 PROCESS FOR CHLORINE DIOXIDE MANUFACTURE TO DECREASE PRODUCTION OF SODIUM SULPHATE,
Toronto Univ. (Ontario). Dept. of Chemical Engineering.
W. H. Rapson.
Preprints, 1973 International Pulp Bleaching Conference, June 3-7, 1973, Vancouver, B.C., p 171-176. 1 tab, 1 diag, 13 ref. (Jointly sponsored by TAPPI and CPPA).

Descriptors: *Waste water treatment, *Bleaching wastes, *Pulp wastes, *Chlorination, *Costs, *Equipment, Chemical reactions, Pulp and paper industry, Effluents, Pollution abatement, Water pollution control, Sodium chloride, Sodium compounds, Sulfur compounds, Sulfates, Sodium sulfate, Chemicals, Inorganic compounds.
Identifiers: Chlorine dioxide, Bleach plants, Kraft mills, Chemical recovery, Hydrochloric acid, Sulfuric acid, R4 chlorine dioxide process.

The so-called 'R4' process of chlorine dioxide bleach generation has been developed by modification of the earlier 'R2' and 'R3' processes in order to decrease (by 50% or more) the amount of Na sulfate by-product obtained in the older processes to just the right amount needed by a bleached kraft pulp mill per ton of pulp, while producing any desired volume of chlorine dioxide. This is achieved by replacing up to 50% of the sulfuric acid and all the NaCl in an R2 or R3 generator with HCl. The Na sulfate (called 'saltcake' in the paper vernacular) is used as cooking liquor makeup chemical. Any excess is converted by reaction with HCl into sulfuric acid plus NaCl. Details of this economical process are indicated. (Brown-IPC)
W74-07378

THE EFFLUENT-FREE BLEACHED KRAFT PULP MILL. PART IV. THE SALT RECOVERY PROCESS,
Erco Envirotech Ltd., Toronto (Ontario); and Erco Envirotech Ltd., Salt Lake City, Utah.
D. W. Reeve, J. A. Lukes, K. A. French, and W. H. Rapson.
Preprints, 1973 International Pulp Bleaching Conference, June 3-7, 1973, Vancouver, B.C., p 191-197. 3 tab, 2 fig, 13 ref. (Jointly sponsored by TAPPI and CPPA).

Descriptors: *Waste water treatment, *Pollution abatement, *Pulp wastes, *Bleaching wastes, *Sodium chloride, *Water pollution control, Pulp and paper industry, Sodium compounds, Sulfates, Chlorides, Chlorine, Sodium hydroxide, Recycling, Costs, Equipment, Carbonates, Crystallization.
Identifiers: Chemical recovery, Kraft mills, White liquor, Sodium hydroxide, Bleach plants.

The recovery of NaCl from kraft pulp mills is essential for regeneration of pulp bleaching chemicals, for cost reduction of effluent treatment, and for improved environmental protection. In the salt-recovery process described, white liquor is evaporated to a high concentration of NaOH plus Na sulfite, causing crystallization of NaCl and unregenerated pulping chemicals (Na carbonate and sulfate). The recovered NaCl is purified for regeneration of NaOH and Cl. Unregenerated pulping chemicals are removed separately and returned to the mill's chemical recovery cycle. The concentrated white liquor containing all active pulping chemicals may be diluted before addition to the wood chip digester. The new process does not require significant changes in pulp mill operations, yet is adaptable to a wide range of cooking and bleaching conditions. The NaCl concentration is kept at tolerable levels throughout the chemical recovery cycle. The process is unaffected by the composition of the white liquor (kraft cooking liquor). The chemistry, equipment needs, and costs of the salt-recovery process are discussed in some detail. (Brown-IPC)
W74-07379

NEW EFFLUENT PLANT AT COLTHROP BOARD MILLS.
Paper (London), Vol 180, No 4, p 188, 191, Aug 15, 1973. 2 fig.

Descriptors: *Treatment facilities, *Waste water treatment, Water pollution control, *Pulp wastes, *Flocculation, *Biological treatment, Aeration, Suspended solids, Filtration, Filters, Water pollution, Water pollution sources, Water pollution treatment, Pollution abatement, Pulp and paper industry, Europe.
Identifiers: *United Kingdom(Kennet River).

The recently inaugurated effluent treatment plant of Reed Paper and Board Ltd. at Colthrop, England, comprises a Ceca-Wabag contact flocculator and a Davy Paxman rotary vacuum filter. It was designed to treat 68,000 gal/hr of effluent containing 300 to 6000 ppm of solids, so as to reduce this content to below 40 ppm sometimes to as low as 20 ppm. The sedimented water is next aerated and subjected to biological treatment before being returned to the Kennet River. (Witt-IPC)
W74-07380

MECHANICAL WASTE WATER CLARIFICATION AND BIOLOGICAL-CHEMICAL WASTE WATER PURIFICATION USING THE ATTISHOLZ AND RUTHNER SYSTEM (MECHANISCHE ABWASSERKLAERUNG UND BIOLOGISCH-CHEMISCHE ABWASSERREINIGUNG NACH SYSTEM ATTISHOLZ UND RUTHNER),
W. Lutz.
Wochenblatt fuer Papierfabrikation, Vol 101, No 8, p 275-276, 278-281, April 30, 1973. 4 fig, 2 tab.

Descriptors: Treatment facilities, *Waste water treatment, *Biological treatment, *Pulp wastes, *Activated sludge, Chemical precipitation, *Coagulation, *Flocculation, *Sludge treatment, Pulp and paper industry, Polyelectrolytes, Industrial wastes, Effluents, Water pollution treatment, Pollution abatement, Water pollution control, Sedimentation, Waste treatment.
Identifiers: Clarifiers, Ruthner clarifier, Attisholz waste treatment process.

The operating principles and effluent-purifying characteristics (including costs) of the Ruthner clarifier and of the Attisholz biological treatment process are described, with particular reference to the processing of pulp, paper, and paperboard mill waste waters. The Ruthner clarifier is a contact system for sludge sedimentation, using synthetic polyelectrolytes as flocculation aids. The Attisholz process is a modified activated sludge system adapted specifically to the characteristics of paper industry effluents. Experimental and industrial-scale data are given on the joint use of the Ruthner-Attisholz system in various fine-paper, paperboard, wood fiberboard, and sulfite pulp mills. (Speckhard-IPC)
W74-07381

POSSIBILITIES OF EFFLUENT CLARIFICATION (MOEGLICHKEITEN DER ABWASSERKLAERUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
H. L. Dalpke.
Wochenblatt fuer Papierfabrikation, Vol 101, No 8, p 252-255, discussion p 263-264, April 30, 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Waste water treatment, *Pulp wastes, Biological treatment, Treatment facilities, Europe, Pulp and paper industry, Aerated lagoons, Activated sludge, Trickling filters, *Costs, Capital costs, Operating costs, Economic efficiency, *Reviews.
Identifiers: *Germany.

A general review is presented of various approaches to waste water purification available to the pulp and paper industry. The status of effluent treatment technology is surveyed, including primary chemi-mechanical and secondary biological stages. The latter include aerated lagooning, activated sludge treatment, and use of trickling filters. Cost data, emphasizing German economic conditions, are also included. (Speckhard-IPC)
W74-07382

USE OF AMBERLITE XAD-4 FOR EXTRACTION AND RECOVERY OF CHLORINATED INSECTICIDES AND POLYCHLORINATED BIPHENYLS FROM WATER,
Bristol Univ. (England). Dept. of Inorganic Chemistry.
P. R. Musty, and G. Nickless.
Journal of Chromatography, Vol 89, No 2, p 185-190, Feb 27, 1974. 7 tab, 9 ref.

Descriptors: *Waste water treatment, *Chlorinated hydrocarbon pesticides, Water analysis, *Polychlorinated biphenyls, Gas chromatography, Chromatography, Resins, *Insecticides, DDD, DDE, DDT, Endrin, Dieldrin, Aldrin, Separation techniques, Analytical techniques, *Pollutant identification.
Identifiers: BHC(Benzene hexachloride-hexachlorocyclohexane), Lindane, Chemical recovery, *Amberlite XAD.

Amberlite XAD macroreticular resinous adsorbents were used to extract and recover both chlorinated insecticides (alpha- and beta-BHC, lindane, aldrin, dieldrin, endrin, p,p'-DDD, o,p'- and p,p'-DDT, and p,p'-DDE) and PCB's from water. One liter of tap water was doped at the ppb level and the resin-adsorbed insecticides were eluted with diethyl ether/hexane. When determined by electron capture gas chromatography, aldrin and p,p'-DDE were the only insecticides not quantitatively recovered. Recovery of PCB's was ca. 76%. (Brown-IPC)
W74-07383

REDUCTION OF THE VOLUME OF POLLUTANTS DISCHARGED AND OF FRESH WATER CONSUMPTION (SOKRASHCHENIE SBROSA

ZAGRYAZNENII I UMEN'SHENIE RASKHODA SVEZHEI VODY),
Vsesoyuznyi-Nauchnyi Planovii Otdel Bumazhnoi Promyshlennost (USSR).
L. I. Luzina.
Bumazhnaya Promyshlennost', No 9, p 7-8, Sept 1973. 1 fig.

Descriptors: *Water conservation, *Water reuse, *Recirculated water, *Pulp wastes, *Waste water treatment, Fresh water, Water consumption(Except consumptive use), Effluents, Pulp and paper industry, Filters, Water quality control, Monitoring, Discharge(Water), Condensers, Treatment facilities, Waste treatment, Industrial water, Industrial wastes.
Identifiers: Kraft mills, Chemical recovery, Board(Paperboard) mills, Washers(Pulp-thickening), Black liquor, Pulp washing, USSR.

A new Soviet process for the manufacture of high-yield unbleached kraft pulp from mixed softwoods and hardwoods with efficient recycling of treated effluent waters is described; the process is said to reduce freshwater consumption from 29.7 to 9.8 cu m and effluent volumes from 36.1 to 15 cu m per ton of pulp produced. Preliminary studies of the unbleached pulp manufacturing system, intended for boxboard production, focused on improvements of pulp washing conditions for efficient separation of black liquor, and on minimization of alkali and organic compound losses from the system. The new process features four double-chamber pulp-washing filters; a two-stage recovery of black liquor entrained with digester relief (blow gases); surface condensers in lieu of barometric condensers; partial reuse of purified effluents in various mill departments (wood preparation room, evaporator plant); automatic water quality control for cooling of bearings and other hydraulic functions; and monitoring of water consumption and effluent discharges in all mill departments. (Stapinski-IPC)
W74-07384

ON SOME SPECIAL PROBLEMS OF SULFITE PULP WASTE WATER PURIFICATION (ZU EINIGEN SPEZIELLEN PROBLEMEN DER SULFITZELLSTOFF-ABWASSERREINIGUNG),
Institut fuer Zellstoff und Papier, Heidenau, (East Germany).
H. Schmidt, and G. Weigt.
Zellstoff und Papier, Vol 22, No 9, p 263-269, Sept 1973. 7 fig, 6 tab, 20 ref.

Descriptors: *Sulfite liquors, *Bleaching wastes, *Pulp wastes, *Biological treatment, *Waste water treatment, Waste treatment, Water pollution control, Chlorination, Biochemical oxygen demand, Chemical oxygen demand, Color, Effluents, Activated sludge, Microorganisms, Bacteria, Organic loading, Kinetics, Biodegradation, Chemical reactions, Inhibition.
Identifiers: Sulfite pulp industry, Spent sulfite liquors, Evaporator condensates.

The characteristics (notably BOD load) of spent sulfite pulping liquors are outlined, and experiments are reported on the purification of spent bleaching liquors (especially from sulfite mills) by precipitation, flocculation, and/or ion-exchange adsorption. These processes are recommended where color and COD as well as BOD are to be reduced. Where the achievable BOD reductions are adequate, concentrated spent sulfite pulping liquor can be mixed with dilute spent pulp chlorination liquor and treated jointly in an activation basin for improved removals of BOD and COD. Manometric studies indicated that biodegradation kinetics often follow an initial semilogarithmic and subsequent linear course, suggesting an inhibitory effect. This can frequently be eliminated by inoculating the effluent with adapted microorganisms, thereby lowering the specific sludge loading. Some rate constants indicate particularly rapid oxygen consumption of evaporator condensates, compared to other sulfite mill effluents. (Ward-IPC)
W74-07386

MICROBIOLOGICAL PURIFICATION OF HYDROGEN SULFIDE-CONTAINING KRAFT MILL EFFLUENTS (MIKROBIOLOGICHESKAYA OCHISTKA SEROVODORODNYKH STOCHNYKH VOD SUL'FATNO-TSELLYULOZNOGO PROIZVODSTVA),
N. I. Tkachenko, and L. B. Pomerants.
Khimiya i Tekhnologiya Tsellyulozy i Bumagi -- Trudy Leningradskogo Tekhnologicheskogo Instituta Tsellyulozno-Bumazhnoi Promyshlennosti, No 28, p 108-112, 1972. 2 fig, 1 tab, 14 ref.

Descriptors: *Biological treatment, *Waste water treatment, *Pulp wastes, Sulfur, *Hydrogen sulfide, *Sulfur bacteria, Sulfides, Bacteria, Oxidation, Biodegradation, Sulfates, Effluents, Waste treatment, Industrial wastes, Nutrients, *Filters.
Identifiers: Kraft mills.

A process for the purification of kraft mill effluents, such as digester relief condensates, containing hydrogen sulfide has been developed; it makes use of biological filters. Laboratory-prepared solutions of hydrogen sulfide were supplemented with the necessary nutrients and oxidized in model bio-filters. Thiobacillus thioparus was found to play the dominant role in the oxidation of hydrogen sulfide to elementary sulfur. Comparative analyses of the untreated and treated effluents showed a gradual reduction of hydrogen sulfide concentration accompanied by an increase in sulfate concentration and accumulation of sulfur. The sulfur was retained on the biofilter during the initial phase of filter formation. It could be readily recovered for reuse by washing the bacterial film mechanically. (Stapinski-IPC)
W74-07387

STUDY OF THE ADAPTATION OF AN ACTIVATED SLUDGE TO THE PURIFICATION OF AN INDUSTRIAL EFFLUENT (ETUDE DE L'ADAPTATION D'UNE BOUE ACTIVEE A L'EPURATION D'UN EFFLUENT INDUSTRIEL),
Centre de Recherches du Service de Sante des Armees, Lyon (France). Division de Microbiologie.
P. Le Ral, J. Buatois, J. Peny, and R. Fontanges.
Tribune CEBEDEAU, Vol 26, No 351, p 78-89, Feb 1973. 2 fig, 11 tab, 39 ref.

Descriptors: *Biodegradation, *Activated sludge, Pollutants, *Phenols, *Sulfur compounds, *Industrial wastes, *Oil wastes, Oil industry, Oil pollution, Bacteria, Enzymes, Biochemical oxygen demand, Chemical oxygen demand, Sulfur bacteria, Organic compounds, Hydrocarbons, *Waste water treatment.
Identifiers: Dimethyl sulfoxide, Petroleum refining industry, Aerobacter aerogenes.

The recent introduction of dimethyl sulfoxide (DMSO) into the petroleum refining industry as a solvent for the extractive distillation of aromatic hydrocarbons prompted a pilot-plant study of the biodegradation of DMSO in the presence of phenol, which is also a pollutant in petroleum industry effluents, by activated sludge. The latter was obtained from a petroleum refinery and adapted in the laboratory to media containing phenol as a carbon source. In media containing phenol alone, the sludge achieved nearly 100% BOD reduction, 70% COD reduction, and 90% phenol degradation. The presence of DMSO lowered these efficiencies to 78%, 48%, and 63%, respectively. Inoculation of the mixed substrate with Aerobacter aerogenes (Strain Lo 1314, capable of degrading DMSO) improved the biodegradation process, but not to the levels attained in the absence of DMSO. The degradation of DMSO did not exceed 4-5% in the presence or absence of phenol. Analyses of the activated sludge showed a gradual drop in the number of bacterial species, the presence of a dominant species, and the development of a specialized enzyme systems. (Stapinski-IPC)
W74-07389

SOME EQUIPMENT USED IN FIBRE RECOVERY AND EFFLUENT TREATMENT OPERATIONS.
Paper (London), Vol 179, No 6, p 294, 296, 299-300, March 21, 1973. 8 fig.

Descriptors: *Treatment facilities, *Waste water treatment, *Pulp wastes, *Equipment, *Sludge treatment, *Filters, Dissolved solids, Dewatering, Industrial wastes, Waste treatment, Pulp and paper industry, Liquid wastes, Waste water(Pollution), Water pollution control.
Identifiers: Fiber recovery, Fines(Fine fibers), Screw presses.

The operation, some constructional features, and relative advantages of the following effluent-treatment units are described: a fluid-bed incinerator for sludge disposal; the Floatwash Fractionator made by Fractionator AB, Sweden, for recovering reuseable fine fibers from primary paper mill effluents; the Brassert Strainer, a pressurized filter for mechanical solids removal from aqueous and other liquid wastes; the Confac filtration system; the Jones Pressmastsr, an automatic vertical screw press for liquid-solids separations; and the Beloit-Jones Polydisk Filter. (Witt-IPC)
W74-07390

HOW POLYACRYLAMIDES CAN HELP EFFLUENT PROBLEMS,
Allied Colloids Ltd., Bradford (England).
B. D. Fisher.
Paper (London), Vol 179, No 7, p 364-366, 368, April 4, 1973. 1 ref.

Descriptors: *Waste water treatment, *Polyelectrolytes, *Flotation, Sedimentation, *Flocculation, *Coagulation, *Pulp wastes, Chemicals, Chemical precipitation, Pulp and paper industry, Effluents, Industrial wastes, Pollution abatement, Water pollution control, Polymers.
Identifiers: Savealls, Paper machines, Polyacrylamide.

Polyacrylamides can serve in the paper industry as aids to the improved retention of fine fibers and fillers on the paper-machine wire (so as to reduce the effluent's pollution load). They can also improve the efficiency of various flotation- or sedimentation-type savealls when used as flocculants or coagulation aids. Laboratory techniques for evaluation of polyacrylamide preparations, their mechanism of action, and beneficial effects on effluent treatment processes are reviewed. (Witt-IPC)
W74-07391

ENVIRONMENTAL PROTECTION TECHNIQUES TO BE APPLIED IN A BLEACHED KRAFT PULP MILL IN SWEDEN,
Munksjo A.B., Jonkoping (Sweden).
U. Albertsson, and S. Bergkvist.
Tappi, Vol 56, No 12, p 135-138, Dec. 1973. 6 fig, 1 tab.

Descriptors: Pulp and paper industry, Europe, *Pulp wastes, *Bleaching wastes, *Pollution abatement, *Closed conduits, Industrial wastes, Water pollution, Evaporation, Oxygen, Effluents, Discharge frequency, Waste disposal, Lignins.
Identifiers: Closed systems, Kraft mills, White liquor(Kraft cooking liquor), Continuous digesters, Washing(Pulp), Oxygen bleaching, *Sweden.

An environmental protection project sponsored during 1970-1973 by the Swedish Pulp and Paper Association to provide a basis for near-future antipollution investments has already yielded results that will be put to work in the kraft mill of Munk-

sjo AB. at Aspa, which was scheduled for startup at the end of 1973. Pulping of wood in this mill is performed in a completely closed cooking liquor system, including a continuous digester with so-called 'Hi-Heat' washing of cooked chips, plus screening, oxygen bleaching, and bleached pulp washing equipment. The most heavily polluted condensate is treated in a stripper column between two evaporation stages. A special system is under construction for controlled handling of temporary effluent discharges. The mill's total lignin discharge is estimated at one-half that of a conventional kraft pulp mill. (Brown-IPC)
W74-07392

BIODEGRADATION OF RESIN ACID SODIUM SALTS,
Forest Service (USDA), Pineville, La. Southern Forest Experiment Station.
R. W. Hemingway, and H. Greaves.
Tappi, Vol 56, No 12, p 189-192, Dec 1973. 5 fig, 17 ref.

Descriptors: *Waste water treatment, *Biodegradation, *Resins, *Salts, *Sodium compounds, Water pollution sources, Sulfite liquors, *Pulp wastes, Microorganisms, *Activated sludge, *Bacteria, Temperature, Incubation, Hydrogen ion concentration, Sewage.
Identifiers: Spent sulfite liquor, Resin acids, Resin soaps, Palustric acid, Abietic acid, Pimaric acid.

The Na salts of resin acids were readily degraded by microflora from two types of river water and from an activated sewage sludge. A lag phase with little or no salt degradation but with rapid bacterial development was observed, which was greatly extended by a decrease of incubation temperature. After this lag phase, the salts were rapidly decomposed with either of the three natural inocula. The Na salts of levopimaric, palustric, and dehydroabietic acids were most rapidly degraded, followed by abietic and neoabietic acid salts. Pimaric and isopimaric acid salts were the most resistant to biodegradation. Addition of 10% of a neutralized spent bisulfite pulping liquor did not affect cell growth or resin salt degradation, but the addition of acidic spent sulfite liquor restricted degradation by activated sludge until the pH had risen to 7.3. (Brown-IPC)
W74-07393

WATER REUSE AND RECYCLE IN KRAFT BLEACHERIES,
CIP Research Ltd., Hawkesbury (Ontario).
J. A. Histed, and F. M. A. Nicolle.
Pulp and Paper Magazine of Canada, Vol 74, No 12, p 80-91, Technical Paper T386, Dec 1973. 15 fig, 10 tab, 19 ref.

Descriptors: *Bleaching wastes, *Pulp wastes, *Waste water disposal, Discharge(Water), Pulp and paper industry, United States, Canada, North America, Effluents, Water releases, *Water reuse, Recirculated water, *Waste water treatment, *Industrial wastes.
Identifiers: Washing(Pulp), Bleached pulps, Countercurrent washing.

A survey published Sept. 1970 by the Alkaline Pulping Committee of the Canadian Pulp and Paper Association's Technical Section showed that effluent volumes leaving Canadian kraft mill bleacheries ranged from 12,700 to 57,000 U.S. gal per ton of pulp. Methods of reducing these volumes were to be investigated in a study proposed to the Committee on Pollution Abatement Research (CPAR), Environment Canada. A survey of current bleached pulp washing practices in North America indicated that three countercurrent methods predominate in CEDED-sequence plants (C = chlorination, E = alklaine extraction, D = chlorine dioxide), namely, direct, split-flow, and jump-stage washing. The direct procedure produced the least effluent, as low as 8100 gal per air-dry ton. Laboratory studies showed that this can be further decreased to ca. 1600 gal/a.d. ton, without adverse effects on the quality of the bleached pulps. (Brown-IPC)
W74-07394

EFFLUENT - FIBRE RECOVERY - WATER SAVINGS; CASE HISTORY OF A RECENT PLANT INSTALLATION,
Paperboard, Machinery Services Ltd., Leatherhead (England).
K. D. Blundell.
Paper (London), Vol 179, No 5, p 232, 234-236, 239, March 7, 1973. 6 fig, 1 tab.

Descriptors: *Treatment facilities, *Pulp wastes, Foreign countries, Europe, *Waste water treatment, Water pollution control, Pollution abatement, Flocculation, Suspended folids, Fibers(Plant), Filters, *Filtration.
Identifiers: *United Kingdom(Northern Ireland), Fines recovery, Site selection, Clariflocculator(Dorr-Oliver).

The effluent-treatment facilities recently installed at the Lurgan Boxmaking Co. in Lurgan, Northern Ireland, comprise a Radcliffe filter unit for recovering fine fibers and a Dorr-Oliver Clariflocculator. Considerations leading to the selection and location of this installation are outlined, and various stages in the implementation of this waste-treatment project are reviewed. A flow diagram of the plant is included. (Witt-IPC)
W74-07395

UTILIZATION OF WHITE WATER IN BOARD MILLS (ISPOL'ZOVANIE OBOROTNOI VODY NA KARTONNYKH FABRIKAKH),
Ukrainskii Nauchno-Issledovatelskii Institut Bumagi, Kiev (USSR).
N. I. Dubitskaya, and A. G. Galenko.
Bumazhnaya Promyshlennost', No 9, p 9-10, Sept. 1973. 1 fig.

Descriptors: Water conservation, Treatment facilities, Recirculated water, *Waste water treatment, *Water reuse, *Pulp wastes, *Chlorination, *Coagulation, Suspended solids, Biochemical oxygen demand, Color, Biological treatment, Closed conduits, Pulp and paper industry, Europe, Aluminum, Industrial water, Industrial wastes, Polyelectrolytes.
Identifiers: Board mills(Paperboard mills), Board machines, *White water, Clarifiers, Aluminum sulfate, Polyacrylamide, Coagulants, *USSR.

A schematic description is given of a new water-recycling and reuse system for a paperboard mill to be added to an existing integrated pulp and paper mill at Zhidachev and a similar system to be installed at a board mill in Rostok, USSR. The Zhidachev board machine will produce 140,000 yearly tons of board made from waste paper plus a bleached chemical pulp facing. Effluent from this machine plus an older board mill will be treated first with chlorine for color removal, then coagulated with alum and polyacrylamide, and passed to contact clarifiers. The treatment should remove 100% of the color, 50% of the 5-day BOD, and 94-98% of suspended solids, so that the clarified water can be recycled and substituted for 40 cu m of the 70 cu m of fresh water needed per ton of board produced. Effluents from an existing paper mill and two pulp mills will be treated separately from the board machine white waters by mechanical and biological methods. A completely closed board-machine water circuit is contemplated as the next phase of this water economy drive. (Stapinski-IPC)
W74-07397

PILOT APPLICATION OF THE ROTATING BIOLOGICAL SURFACE CONCEPT FOR SECONDARY TREATMENT OF INSULATING BOARD MILL EFFLUENTS,
Boise Cascade Corp., Portland, Oreg.
D. J. Bennett, T. Needham, and R. E. Summer.
Tappi, Vol 56, No 12, p 182-187, Dec 1973. 7 fig, 6 tab, 10 ref.

Descriptors: *Pulp wastes, *Biological treatment, *Canada, Biochemical oxygen demand, Toxicity, Pollution abatement, Regulation, Effluents, Suspended solids, *Waste water treatment, Water pollution treatment, Water pollution control.
Identifiers: *Rotating biological surface, Groundwood mills, Mechanical pulping, Insulating board(Fiberboard), Board Mills.

The rotating biological surface (RBS) process was evaluated on a pilot scale as a potential method for the biological treatment of aqueous effluents from an insulating board (fiberboard) mill, which are typical of discharges resulting from the mechanical (groundwood) process of pulp manufacture. Reductions in BOD and total suspended solids were comparable to those reported for established secondary treatment schemes. The RBS-treated effluent's toxicity was reduced to a level complying with Canadian federal antipollution regulations. (Brown-IPC)
W74-07398

A PRACTICAL AND TROUBLE-FREE SEWER SPILL MONITOR,
Prince Albert Pulp Co. Ltd. (Saskatchewan).
W. B. Barnes.
Canadian Pulp and Paper Association, Technical Section, Proceedings, No 2, p D74-D76, Oct 1973. 8 fig.

Descriptors: *Waste water treatment, *Pulp wastes, *Instrumentation, *Monitoring, Discharge frequency, *Sewers, *Canada, Pulp and paper industry, Waste disposal, Industrial wastes, Overflow, Effluents, Pollution abatement, Equipment.
Identifiers: Tanks(Sewage collection), Recording instruments.

Effluent control regulations at Prince Albert Pulp Co. Ltd. in Saskatchewan are being aided by a nearly maintenance-free liquor spill recorder for pulp mill sewers in conjunction with three spill-collection tanks for catching overflows in the digester, chemical recovery, and evaporator areas. (Brown-IPC)
W74-07404

A REVIEW OF COLOUR REDUCTION TECHNOLOGY IN PULP AND PAPER MILL EFFLUENTS,
Beak (T. W.) Consultants Ltd., Montreal (Quebec).
M. A. Tyler, and A. D. Fitzgerald.
Canadian Pulp and Paper Association, Technical Section, Proceedings, p D116-125, 1972. 10 fig, 2 tab, 8 ref.

Descriptors: *Pulp wastes, *Bleaching wastes, *Color, *Waste water treatment, Water pollution control, Water quality control, Economic efficiency, *Costs, Lime, *Activated carbon, *Coagulation, Aluminum, Chlorine, Oxygen, Chlorination, Effluents, Adsorption, Operating costs, Capital costs, Sludge treatment, Dewatering, Reviews.
Identifiers: Aluminum sulfate, Oxygen bleaching.

Over 60 literature reports on effluent treatment for color removal were studied to assess the status of practices in the pulp and paper industry. Lime treatment seems to be the best established method, achieving 65% color removal from bleached kraft effluents at a capital cost of $1 to 1.5 million and operating costs of $1.0-1.5 per ton of pulp. Coagulation with alum gives similar results at similar costs, but requires improved systems for handling the sludge formed which is difficult to dewater. Adsorption on activated carbon accomplishes complete color removal but at high operating costs. Switching from chlorine to oxygen bleaching of kraft pulp would reduce effluent color by 60-65% and save ca. $2 per ton of

pulp in chemical costs. Capital costs for such a conversion are estimated at $2 million. (Brown-IPC)
W74-07406

POLLUTION CONTROL BY RECYCLING EFFLUENT,
Kimberly-Clark of Canada Ltd., Huntsville (Ontario).
R. F. Gropp.
Canadian Pulp and Paper Association, Technical Section, Proceedings, No 1, p D8-D11, Aug 1973. 4 fig, 2 ref.

Descriptors: Treatment facilities, *Pulp wastes, *Canada, *Flocculation, *Coagulation, Chemical precipitation, *Filtration, Lime, Magnesium hydroxide, *Waste water treatment, Waste water disposal, Water pollution control, Recirculated water, *Water reuse, Discharge(Water), Sewers, Pulp and paper industry, Solid wastes, Suspended solids, Industrial wastes, Waste treatment, *Recycling.
Identifiers: Tissue papers, Savealls, White water, Screen rejects, Stock pulp chests.

At Huntsville, Ontario, a tissue mill has been designed to meet stringent effluent quality regulations. A high proportion of the white water (paper machine waste water) is treated in a large disk-type saveall, using magnesium hydroxide as primary flocculant, and is then recycled to the tissue paper manufacturing process. A smaller portion is bled from the system, subjected to primary clarification, then passed through polishing basins and percolation beds before discharge to the relatively small river. Stock chests are designed for minimum fiber loss during paper grade changes. Screen rejects are thickened and treated as garbage, rather than flushed to U-drains. A flowchart of the water treatment cycle is given, along with a chemical description of Kimberly-Clark's patented lime process for precipitation of magnesium hydroxide. (Brown-IPC)
W74-07407

POLLUTION CONTROL THROUGH TRAINING, EDUCATION, AND RIGOROUS FOLLOW-UP,
Rolland Paper Co. Ltd., St. Jerome (Quebec).
For primary bibliographic entry see Field 5G.
W74-07408

WATER REUSE IN PROTEIN FEED PROCESS UTILIZING LUMBER MILL WASTES,
Arizona Univ., Tucson.
D. H. White, and D. T. Simmons.
In: Proceedings of the National Conference on Complete Water Reuse (sponsored by the American Institute of Chemical Engineers and the U.S. Environmental Protection Agency), April 23-27, 1973. p 488-496 (1973). 11 fig, 2 tab, 12 ref.

Descriptors: *Water reuse, *Industrial water, *Saw mills, *Moisture availability, *Wood wastes, *Hydrolysis, *Fermentation, *Proteins, Feeds, Waste disposal, Solid wastes, Air pollution, Incineration, Water circulation, Cooling water, Cooling towers, Water consumption(Except consumptive use), Freshwater, Yeasts, Economic feasibility, United States, Moisture content.
Identifiers: Hydrolysis industry, Wood hydrolysis, Sawmill residues.

About 40 million tons of sawmill residues are produced annually in the U.S.A., of which 70% originate in the West and South where economic conditions may favor the development of a billion-dollar hydrolysis-fermentation industry for production of synthetic feed protein via yeast cultivation. This would greatly alleviate the need for wood waste disposal by incineration (and the attendant air pollution problems). Although the hydrolysis industry consumes large volumes of water, most of this can be recycled. In theory, the wood's natural moisture content could supply more water than would be needed for sawmill steam generation, but cooling towers may require some freshwater intake. (Brown-IPC)
W74-07409

AN OVERVIEW OF WATER REUSE POTENTIAL IN PULP AND PAPER MANUFACTURING,
Wapora, Inc., Washington, D.C.
H. W. Gehm.
In: Proceedings of the National Conference on Complete Water Reuse (sponsored by the American Institute of Chemical Engineers and the U.S. Environmental Protection Agency), April 23-27, 1973. p 458-462 (1973). 33 ref.

Descriptors: *Water consumption, *Industrial water, *Pollution abatement, *Recycled water, *Water reuse, Pulp and paper industry, *Pulp wastes, *Waste water treatment, Waste treatment, Effluents, Discharge(Water), Bleaching wastes, Water resources, Water management(Applied), United States.
Identifiers: Kraft mills, Resource sharing, Integrated corporations, Multiproduct enterprises.

The U.S. pulp and paper industry has made considerable progress in recycling its process waters, especially in kraft pulp and paper mills and bleach plants. Although further reductions in water usage and effluent volumes are being researched and developed, the limits of this approach are near. Future advances will more likely concentrate on external treatments for water reclamation. Several mills of a complex (integrated) enterprise manufacturing different products may have to share the available water resources, e.g., by reusing treated water from one operation in another in which quality requirements are less stringent. Centralized water and effluent treatment for such complex corporations is an attractive alternative solution. (Brown-IPC)
W74-07410

THE PULP AND PAPER INDUSTRY AND THE ENVIRONMENT,
British Paper and Board Makers' Association, London (England).
J. S. Evans.
International Conference on Plastics and Paper, London, May 22-23 1973, Paper No. 4.2, 2 p, Plastics Institute, London.

Descriptors: *Europe, *Pulp and paper industry, *Pulp wastes, *Water pollution control, *Costs, Capital costs, Operating costs, Pollution abatement, Water quality control, Water quality standards, Legislation, Regulation, Economics, Industrial water, Water consumption(Except consumptive use), Water resources, Water management, Effluents, Toxicity, Biodegradation, Waste water disposal, Waste disposal, Fresh water, Treatment facilities.
Identifiers: OECD Nations.

Total water consumption by the pulp and paper industries of all OECD countries was estimated at 21,842,000,000 cu m in 1970. Modern technology can design new mills requiring only 10-20% of this water quantity. Since the elimination of Hg and other toxic components from the papermaking process, most effluent constituents do not differ radically from natural materials (lignin, carbohydrates, and organic acids) and are fairly readily biodegraded. Their treatment is largely a matter of economics. Legislation on water pollution control follows two different approaches. In Finland, Spain, Sweden, and Switzerland, the basic principle is to maintain or restore natural water quality. Other countries compromise between various end-uses of water resources, including industrial development and waste disposal. In the U.K., the paper industry uses ca. 287,000,000 gal/day of freshwater. Between 1965 and 1970, British paper and board manufacturers have spent 6.5 million pound sterling on effluent-treatment facilities, plus 6.2 million pound sterling on operating costs. Capital investments in 1971/72 ran to 1.8 million pounds, and the investment needed to meet new legislative standards during 1973-1977 are projected at 17.5 million pound sterling. (Brown-IPC)
W74-07411

EVALUATION OF CURRENT TECHNIQUES FOR NUTRIENT REMOVAL FROM WASTEWATERS,
Mississippi State Univ., State College. Dept. of Civil Engineering.
A. Shindala.
Water Resources Bulletin, Vol 8, No 5, p 987-998, October, 1972. 32 ref. OWRR A-043-Miss(2).

Descriptors: *Waste water treatment, Saline water, *Drainage water, *Nutrient removal, *Nitrogen compounds, *Phosphorus compounds, Denitrification, Water treatment, Water quality control, Water pollution treatment, Eutrophication.

A comprehensive evaluation of current techniques for removal of nitrogen and phosphorus was conducted. Extensive searchings of the literature demonstrated that the technology is available to provide effective nutrient removal at a resonable cost. Current methods for phosphorus removal include biological treatment, chemical precipitation, and ion exchange. Nitrogen removal process includes biological denitrification, ammonia stripping, and ion exchange. (Skogerboe-Colorado State)
W74-07441

AN EXPLANATORY WORK ON THE OXIDATION OF AMMONIA BY POTASSIUM FERRATE (VI),
Ohio State Univ., Columbus. Dept. of Chemical Engineering.
A. W. Strong.
Available from the National Technical Information Service as PB-231 873; $5.25 in paper copy, $1.45 in microfiche. M Sc Thesis, 1973. 38 p, 12 fig, 13 tab, 15 ref, append. OWRR A-031-OHIO(2).

Descriptors: *Waste water treatment, *Oxidation, *Ammonia, Nitrogen, Chemical reactions, Sewage treatment.
Identifiers: *Potassium ferrate.

Ferrate (VI) not only can be used to oxidize the ammonia but can also oxidize organic compounds, serve as a bactericide, and could coagulate phosphates with the ferric hydroxide formed during reaction. The rate of conversion of ammonia was substantially increased with increasing temperature in the range studies. There was little conversion of ammonia below a pH of 7. Reactions run without buffer took longer than those run with buffers. The approach used for ammonia removal did not prove practical. The only means by which it could become useful would be through either the use of a catalyst to promote ammonia reaction or through the continuous addition of ferrate (VI) to hold a constant concentration level. Sulfate ion did not effect the decomposition rate of ferrate (VI). (Knapp-USGS)
W74-07454

PRODUCTION FUNCTION THEORY FOR USE IN OPTIMAL PLANNING DECISIONS,
Kentucky Univ., Lexington.
J. R. Marsden, D. E. Pingry, and A. Whinston.
In: Proceedings of the Midwest AIDS Conference, April 21-22, 1972, Cincinnati, Ohio, 1972. 4 p, 2 ref. OWRR A-024-IND(3).

Descriptors: *Planning, *Waste water treatment, *Decision making, *Optimum development plans, Capital, Optimization, Variable costs.
Identifiers: *Production functions.

The approach considered uses engineering relationships within the context of economic analysis attempting to derive theoretical analytic production and cost functions. Given as complete specification of the production process, a production frontier of maximal output levels obtainable from differing input combinations is derivable. This production frontier forms the basis for the development of a 'production function' for the process. No information is contained in the production function that is not available directly from the full specification of the production process. The production function is thus treated as a convenient intermediate step in the determination of a general 'least-total-cost' relationship. This relationship can well serve the basis for optimum future planning decisions. (Wiersma-Purdue)
W74-07460

APPLICATION OF A LARGE SCALE NON-LINEAR PROGRAMMING PROBLEM TO POLLUTION CONTROL,
California Univ., Los Angeles.
G. W. Graves, D. E. Pingry, and A. Whinston.
In: AFIPS Conference Proceedings, Vol 39, p 123-134, 1971. 2 fig, 2 tab, 11 ref. OWRR B-020-IND(23).

Descriptors: *Water pollution treatment, *Pollution abatement, *Water quality control, *Flow augmentation, Algoriths, River basin development, *Dissolved oxygen, Mathematical studies, Water quality standards.
Identifiers: *Non-linear programming, By-pass piping, White river basin.

The procedure used in constructing the river basin model is to divide the river into small sections and place constraints on the water quality at the end of these sections. In all cases, the water quality criteria used is the level of dissolved oxygen concentration. The level of dissolved oxygen at the end of the river sections is calculated using the Streeter-Phelps equations or some later variation. Cost functions are then estimated and a mathematical programming problem of the following form is solved: Minimize: The total cost of pollution abatement structures, Subject to: Water quality in each section of the river better than some given set of quality goals. A model of a river basin of the form suggested is presented. Simultaneously considered are the following treatment methods: (1) Flow augmentation, (2) By-pass piping, and (3) Treatment plant (regional and at polluter). Also shown is that linear constraints, consistent with the linear programming technique, are not appropriate when these treatment alternatives are considered. Therefore, a nonlinear programming algorithm is used. Some details of the algorithm are discussed and the model applied to the White River Basin in Indiana. (Wiersma-Purdue)
W74-07461

APPLICATION OF NONLINEAR PROGRAMMING TO WATER QUALITY CONTROL,
Kentucky Univ., Lexington.
J. R. Marsden, D. E. Pingry, and A. Whinston.
Water, Air, and Soil Pollution, Vol 2, p 155-169, 1973. 3 fig, 5 tab, 6 ref. OWRR A-024-IND(7).

Descriptors: *Water quality control, *Optimization, *Model studies, *Water pollution treatment, *Water pollution control, Mathematical models, Economics, Flow augmentation, Cooling towers, Thermal, Water temperature, Biochemical oxygen demand.
Identifiers: By-pass piping, Regional treatment plants, Planning model, West Fork White River.

Planning the design of an efficient waste treatment system can be aided through the use of mathematical models and optimization theory. This point of view is illustrated by formulating a model and applying it to a specific river basin. While the models give useful insights, limitations remain inherent in the models. Suggestions and comments are made for resolving some of the resulting economic questions.
W74-07462

UTILIZATION OF FIBROUS WASTES AS SOURCES OF NUTRIENTS,
North Carolina State Univ., Raleigh. Dept. of Animal Science.
J. M. Leatherwood.
Available from the National Technical Information Service as PB-223 625, $3.00 in paper copy, $1.45 in microfiche. Environmental Protection Agency, Report EPA-670/2-73-090, 1973. 16 p, 4 tab, 3 ref. EPA EP-00274.

Descriptors: *Waste water treatment, *Nutrients, *Cellulose, Fermentation, Anaerobic bacteria, Biodegradation, Hydrolysis, Feeds, Enzymes, Biological treatment, Fungi.
Identifiers: *Ruminococcus albus, *Trichoderma viride.

To develop a biological system for conversion of natural cellulosic wastes to products utilizable as animal nutrients, Trichoderma viride, one of the most potent cellulolytic fungi, was introduced to long-term incubations of cotton linters with culture filtrates of T. viride resulting in the degradation of about one-half of the cellulose. An experiment was designed to yield nutrients from newsprint digested by enzymes in T. viride culture in a natural silo-type of anaerobic fermentation. The newsprint was unprinted and had been shredded in a hammer mill equipped with a large mesh screen. Cellulolytic activity was determined in 0.1 ml of the supernatant liquid of both the cultures prior to addition to the fermenter and the liquid samples and product collected from the fermenter. Cultures of T. viride varied in the amount of cellulolytic activity in the supernatant liquid. Sequential addition of cultures and newsprint approximately on a three-week interval was accepted as the best alternative plan. Subsequently 200 ml samples of fermenter liquid were collected for analyses. Soluble carbohydrates and proteins did not accumulate in the fermenter liquid as had been anticipated. (Jones-Wisconsin)
W74-07472

SELECTION AND OPERATION OF SMALL WASTEWATER TREATMENT FACILITIES - TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
Available from the National Technical Information Service as PB-224 266, $4.25 in paper copy, $1.45 in microfiche. Report No. EPA-430/1-73-005, April 1973. 137 p, 59 fig, 29 tab, 76 ref, 6 plates.

Descriptors: *Waste water treatment, *Treatment facilities, *Training, *Education, Operation and maintenance, Sewage treatment, Aquatic environment, Water pollution effects, Municipal wastes, Industrial wastes, Technology, Septic tanks, Settling basins, Monitoring, Eutrophication, Sampling, Coagulation, Activated carbon, Filtration, Water quality.
Identifiers: *Small waste flows.

Comprehensive information is presented on small wastewater treatment facilities which will be of great value as an adjunct to classroom presentations. The reference outlines have been selected and developed with a goal of providing the student with a fund of the best available current knowledge pertinent to the subject. All sewage treatment is accomplished by application of the natural phenomena of biological, physical, and chemical processes, which are described. Subjects covered include the freshwater environment, effects of pollution on aquatic life, water pollution by domestic wastes, and sources and effects of industrial wastes. Treatment methods for small flows include septic tanks, small treatment systems (package plants), advanced waste treatment plants for small waste flows, sewage lagoons, and sewage lagoon operation and maintenance. Surveillance and operations controls include general needs, reports and control measurements, control tests and sampling for operating wastewater treatment plants, sampling in water quality studies, and operational inspections. (Auen-Wisconsin)
W74-07485

MOINA SP. (CLADOCERA: MOINIDAE) IN A SEWAGE PLANT, WELLINGTON, REFERRED TO MOINA TENUICORNIS SARS, 1896 (NOTE),
Wellington City Corp. (New Zealand). Works Dept.
For primary bibliographic entry see Field 5A.
W74-07569

5E. Ultimate Disposal Of Wastes

GEOLOGIC ASPECTS OF WASTE SOLIDS AND MARINE WASTE DEPOSITS, NEW YORK METROPOLITAN REGION,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5B.
W74-07171

LAND DISPOSAL OF WASTEWATER--LITERATURE REVIEW FOR 1973,
New York State Dept. of Environmental Conservation, Albany.
For primary bibliographic entry see Field 5D.
W74-07327

ORGANIZATION OF THE COLLECTION AND DECONTAMINATION OF INDUSTRIAL AND DOMESTIC RADIOACTIVE SEWAGE, (IN RUSSIAN),
For primary bibliographic entry see Field 5D.
W74-07362

WATER REUSE AND RECYCLE IN THE D(C)EDED BLEACH SEQUENCE,
CIP Research Ltd., Hawkesbury (Ontario).
For primary bibliographic entry see Field 5D.
W74-07377

LAND DISPOSAL OF WASTE GASES: III. SORPTION PATTERNS FROM BURIED GAS INJECTION PIPES,
Arizona Agricultural Experiment Station, Phoenix.
For primary bibliographic entry see Field 5B.
W74-07422

5F. Water Treatment and Quality Alteration

WATER TREATMENT APPARATUS,
For primary bibliographic entry see Field 5D.
W74-07196

METHOD OF AND APPARATUS FOR THE PURIFICATION OF WATER CONTAINING ORGANIC CONTAMINANTS,
Laboratorium fuer Adsorptionstechnik, G.m.b.H., Frankfurt am Main (West Germany). (assignee).
For primary bibliographic entry see Field 5D.
W74-07199

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
For primary bibliographic entry see Field 5D.

W74-07251

HYGIENIC FEATURES OF SILICATE ANTICORROSION COATINGS FOR WATER RESERVOIRS, (IN RUSSIAN),
Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad (USSR).
A. G. Ilichkina.
Gig Sanit. Vol 37, No 2, p 35-38. 1972. (English summary).
Identifiers: *Anti-corrosion coatings, Chlorine, Corrosion, Reservoirs, Silicates, *Potable water, *Public health, *Water treatment, Water pollution treatment, Water quality standards.

Anticorrosion coatings had a negative effect on drinking water quality. When reservoir walls coated with SNZhS (average modular Na liquid glass) and ZhS-80 (brand name of liquid glass) were disinfected with chloramin at a dose of 20 mg Cl/l and washed twice with water in the course of 2 days, the quality of the drinking water met the requirements of the 'Drinking Water' standard. VKZhS (highly modular K liquid glass) was unfit for use, because after its contact with Cl the Fe of the coating passed into the water and produced flocculation which persisted even after filtration of water.--Copyright 1973, Biological Abstracts, Inc.
W74-07364

HYGIENIC EVALUATION OF MEANS OF ENRICHMENT WITH SALTS AND DECONTAMINATION OF DEMINERALIZED WATER, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
D. P. Pogosov, N. I. Omel'Yanets, L. V. Girgor'eva, I. N. Medvedev, and N. V. Mironets.
Gig Sanit. Vol 37, No 8, p 19-22. 1972. (English summary).
Identifiers: Salts, Water pollution, *Potable water, *Public health, *Decontamination, *Demineralization, *Water treatment.

The anionite AB-17-8 micron C and the mineralizer M-16 are recommended for use as reagents for enrichment with salts of demineralized water for its short-term use for drinking purposes. The asbestos-Ag sterilizer requires further improvement, since its present output of Ag ions is low and unstable.--Copyright 1973, Biological Abstracts, Inc.
W74-07365

5G. Water Quality Control

A STUDY OF POTENTIAL INSTITUTIONAL ARRANGEMENTS FOR WATER QUALITY AND WATER RESOURCES (QUANTITY) PLANNING AND MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W74-07051

ECOLOGY AND PRODUCTIVITY OF STRIP-MINE AREAS IN MERCER COUNTY, PENNSYLVANIA,
Grove City Coll., Pa. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-07055

COAL-ENERGY DEVELOPMENT IN THE NORTHERN GREAT PLAINS.
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07056

ECONOMIC STUDY OF THE EFFECT OF MUNICIPAL SEWER SURCHARGES ON INDUSTRIAL WASTES AND WATER USAGE,
Clemson Univ., S.C. Dept. of Economics.
R. D. Elliott.
Water Resources Research, Vol 9, No 5, p 1121-1131, October, 1973. 5 fig, 3 tab, 9 ref.

Descriptors: *Regression analysis, *Non-structural alternatives, *Industrial wastes, *Industrial water, Wastes, Biochemical oxygen demand, Suspended solids, *Pollution taxes(Charges).
Identifiers: *Surcharges(Industrial wastes).

In an effort to control the discharge of industrial wastes, many cities have levied surcharges on industrial wastes having a strength greater than some specified minimum level of biochemical oxygen demand (BOD) or suspended solids (SS). Cities can better evaluate such surcharges by knowing (1) the effect of surcharges on the quantity of waste discharged by firms into municipal systems and (2) the effect of surcharges on the quantity of water demanded by firms from municipal systems. Regression equations, based on data from 34 cities using surcharges, indicate a negative relationship between amount and prices. A surcharge of $27.00/1000 lbs. of BOD would cause a 45% reduction in the pounds of BOD per $1000 value added discharged by industry and 42% reduction in industrial water consumption per $1000 value added. At this average surcharge, a 10% increase in the surcharge would result in an 8% decrease in wastes and a 6% decrease in water usage. Results also indicate that both industrial water usage and waste loads have increased directly with wage rates in the recent past. (Hoffman-North Carolina)
W74-07057

SANITARY SERVICES IN TENNESSEE, 1972.
Tennessee State Planning Office, Nashville.
For primary bibliographic entry see Field 5D.
W74-07060

PROCEDURES AND PROGRAMS TO ASSIST IN THE ENVIRONMENTAL IMPACT STATEMENT PROCESS,
California Univ., Berkeley. Inst. of Urban and Regional Development.
For primary bibliographic entry see Field 6B.
W74-07061

POLLUTION, PRODUCTION, AND COMPENSATION,
Oak Ridge National Lab., Tenn.
C. H. Patrick.
Available from the National Technical Information Service as CONF-73-0423-3, $3.00 in paper copy, $1.45 in microfiche. (1973). 15 p.

Descriptors: *Theoretical analysis, *Air pollution, *Water pollution, *Pollutants, *Cost allocation, Pollution abatement, Abatement, Industrial production, Industrial wastes, Costs, Cost sharing, Coal mines, Cost repayment.
Identifiers: Pollution, *External diseconomies, Coal industry.

The relationship between pollution and production is defined, and the effects of pollution limitation on production and the question of consumption are theoretically examined. Analysis shows that while individuals select desirable and undesirable results of activities to maximize their personal preference function, pollution problems arise when private economic activities impose costs upon a third person who does not share direct benefits of the activities. External diseconomies thus exist when social costs exceed private costs. Pollution, as a by-product of one firm, imposes higher costs on a second firm hence reducing its output. Therefore, prices of the two do not optimally allocate scarce resources as they would without pollution. Compensation is considered from the standpoint of the industry's ability to compensate firms affected by pollution restrictions. The coal industry is concerned that production will be cut as a result of pollution restrictions, so this theoretical framework is applied to determine possible alternative levels at which coal could be produced with restrictions. Factors considered include demand and who determines output restrictions-the coal industry or government. (Grden-North Carolina)
W74-07064

WALLOWA LAKE BASIN COMPREHENSIVE PLAN.
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
For primary bibliographic entry see Field 5D.
W74-07065

BACKGROUND SURVEY. SURFACE DRAINAGE PROGRAM, MADISON, SAINT CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 4A.
W74-07066

WATER QUALITY MANAGEMENT ELEMENT FOR THE KENTUCKY RIVER AREA DEVELOPMENT DISTRICT COMPREHENSIVE WATER AND SEWER PROGRAM.
Mayes, Sudderth and Etheredge, Inc., Lexington, Ky.
For primary bibliographic entry see Field 5D.
W74-07077

PROGRAM DEVELOPMENT PLAN FOR THE MESA-NEW YORK BIGHT REGIONAL PROJECT.
Westinghouse Oceanic Div., Annapolis, Md.
For primary bibliographic entry see Field 6B.
W74-07078

POLLUTION AND INDUSTRY: PROS, CONS OF GROWING FIGHT.
U.S. News and World Report, Vol 71, p 60-63, November 22, 1971.

Descriptors: *Economic impact, *Legal aspects, *Water pollution sources, *Industrial wastes, *Pollution control, Legislation, Industrial effluents, Employment, Federal government, Water quality, Industrial plants, Production, Electric powerplants, Nuclear powerplants, Waste disposal, Waste treatment, Regulations, Standards, Water policy, Development, Costs, Public utilities, Waste water treatment, Environment, Ecology, Government finance, Water law, Judicial decisions.

Many people are losing jobs when plants shut down because companies are unable or unwilling to pay the cost of pollution-control equipment. American factories and powerplants are still belching poisonous gases, dust and wastes. While Congress is moving to enact tough, biting pollution control legislation, the administration is complaining of the 'useless hardships that are being thrust upon industry and workers by that process.' 160 iron foundries have stopped operation within the past three years as well as 59 other plants attributed primarily to environmental pressures. Then, Secretary of Commerce, Maurice Stans, said somewhere between $5 and $10 billion in public and private construction is being held up by environmental actions. Also, the Atomic Energy Commission (AEC) was ordered in court to broaden its consideration of environmental factors in licensing nuclear powerplants, affecting more then 100 plants operating or under construction. Because of these stricter regulations and environmental standards, higher cost will be passed on to consumers, either in rates or in taxes. One en-

vironmentalist suggested a change in pricing electricity from that in which the big consumer gets a lower rate to a social policy of reduced consumption. (Silber-Florida)
W74-07112

NATURAL RESOURCES--WASTE CONTROL.
For primary bibliographic entry see Field 6E.
W74-07116

METALLIC MINERAL MINING OPERATIONS, (ACQUISITION OF SURFACE LANDS FOR WATER QUALITY CONTROL).
For primary bibliographic entry see Field 6E.
W74-07119

THE INTERLAKE AFFAIR,
Businessmen for the Public Interest, Washington, D.C.
A. Polikoff.
Washington Monthly, Vol 3, No 1, p 7-16, March 1971.

Descriptors: *Lake Michigan, *Industrial wastes, *Water pollution sources, *Legal aspects, *Water law, Judicial decisions, Chemical wastes, Wastewater discharge, Oily wastes, Solid wastes, Pollutants, Contaminants(Water), Legislation, Navigable waters, Administrative agencies, Federal government, Water policy, Water pollution, Waste dump, Public health, Impaired water quality, Pollutant identification, Water pollution effects.

In June, 1968, a steelworker, crossing the Little Calumet River on his way to work saw a pipe, extending from the steelplant, spewing black discharge into the river. He telephoned the U.S. Coast Guard to report what he saw. So began the fight to save Lake Michigan. The steel company is Interlake, Inc. Interlake prides itself on being a leader in the fight against pollution. The Coast Guard was responsible for the enforcing the 1899 Refuse Act which prohibits dumping of refuse in navigable waters. Analysis of the discharge showed the oil and mill scale were spewing from the outfall. Discharging either substance violated the Refuse Act. Interlake, after unsuccessfully pleading for dismissal, changed its plea to nolo contendere and entered affidavits stating that the problem had been corrected by structural improvements and that the company was in the midst of a $30 million pollution abatement program. Despite this the court found Interlake guilty and fined it the minimum $500. Interlake has continued polluting the water in the same manner and with the same pollutants. The ultimate outcome was indicated in a letter by then Attorney General John Mitchell that the Justice Department was not going to 'vigorously enforce' the Refuse Act as Congress had mandated. (Silber-Florida)
W74-07120

LAUNDRY DETERGENTS AND ENVIRONMENTAL QUALITY,
Indiana Univ., Bloomington. Poplars Research and Conference Center.
For primary bibliographic entry see Field 5C.
W74-07122

POLLUTION SANCTIONS--NEW ALTERNATIVES TO CIVIL LIABILITY,
Food and Agriculture Organization of the United Nations, Rome (Italy). Environment Law.
P. H. Sand.
Journal of Business Law, p 147-154, April 1973. 45 ref.

Descriptors: *Civil law, *Penalties(Legal), *Pollution abatement, Constraints, Pollution taxes(Charges), Damages, Third party effects, Costs, Contracts.
Identifiers: *Tort liability, Japan, Germany, Sweden.

While liability suits are used most frequently to deal with pollution, they are not the only nor necessarily best solution. Pollution sanctions attempt to serve a number of goals: equitable distribution of losses, including external diseconomies; effective reparation of the damages done at minimum overhead costs and prevention of future damages. Alternative remedies examined include emission charges, abatement agreements and criminal sanctions. To determine the best method or combination of methods that could lead to some desired outcome, it is also essential to improve the comparative research methodology being used to examine these alternatives. Existing methods must be improved to assure comparisons of alternatives and to assure that combinations of sanctions are evaluated. It must be also recognized that unilateral changes in pollution sanctions create second-best problems if other legal entities do not coordinate their own sanctions. Thus research must also consider alternatives which encompass international as well as national pollution sanctions or substituted performance by international agencies where states fail to take the required action. (Schroeder-Wisconsin)
W74-07123

AN ECONOMIC ANALYSIS OF SELECTED AGRICULTURAL USES OF WARM WATER IN THE PACIFIC NORTHWEST RESULTING FROM ELECTRIC POWER GENERATION,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3C.
W74-07125

WATER RESOURCES SEMINAR SERIES NO. 2.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W74-07133

HAWAII'S STATEWIDE LAND CLASSIFICATION PROVES ADAPTABILITY AS LAND USE AND ENVIRONMENTAL CONCERNS CHANGE,
Hawaii State Land Study Bureau, Honolulu.
For primary bibliographic entry see Field 4A.
W74-07138

POSSIBLE IMPACT OF COSTS OF SELECTED POLLUTION CONTROL EQUIPMENT ON THE ELECTRIC UTILITY INDUSTRY AND CERTAIN POWER INTENSIVE CONSUMER INDUSTRIES. EXECUTIVE SUMMARY.
National Economic Research Associates, Inc., New York.
Available from the National Technical Information Service as PB207168 $3.00 in paper copy, $1.45 in microfiche. Council on Environmental Quality, Washington, D.C. January 1972. 11p.

Descriptors: *Economic impact, *Pollution abatement, *Costs, *Electric power industry, Industries, Regulation, Thermal pollution, Air pollution, Cooling towers, Equipment, Water pollution control, Employment.
Identifiers: Retrofitting.

A summarized study considers the impacts of pollution controls on the electric utility industry. A brief examination is first made of the demand-supply relationships in the industry, characteristics peculiar to electrical generation, sale and use of electricity, and regulating aspects of the industry. Because the industry is extensively regulated, cost impacts of any changes in technology will not quickly penetrate the market. A number of assumptions are made to estimate the costs of pollution control techniques and their impacts on society. Techniques examined include the burning of low sulfur coal and wet limestone scrubbers to control air pollution and mechanical draft cooling towers to control thermal pollution. Assumptions are made as to which alternative technique each generating plant will use, to the period over which the investment will be made and to operating and capital costs under each technique EPA cost estimates. Under these assumptions the price of electricity may rise by 7% by 1976. There would not, however, appear to be any significant dislocation as a result either in the electrical generating industry of industry in general. Even with some dislocation in the six most energy intensive industries employment impacts will be minimal. (Schroeder-Wisconsin)
W74-07140

METHOD OF AND APPARATUS FOR THE RECOVERY OF OIL FROM WATER,
Col-Mont Corp., Butte, Mont. (assignee).
C. O. Bunn.
U.S. Patent No 3,783,129, 8 p, 6 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 918, No 1, p 419, January 1, 1974.

Descriptors: *Patents, *Pollution abatement, *Oil spills, *Oil pollution, Water pollution control, Water quality control, Equipment, Skimming, *Separation techniques, *Distillation.

A recovery vessel is directed through an area of oil spillage where oil and water are directed into special openings in the vessel. The oil and water are directed over and through a bed of matrix material carried by a conveyor. The oil is sorbed by the matrix material and the cleaned water gravitates through the conveyor to the water sump below the conveyor. The separation of the oil from the matrix material can be accomplished by distillation equipment housed within the vessel. The matrix is composed of finely divided coal and polyethylene and a sufficient amount of water and/or an organic solvent to facilitate the intimate mixing of coal and polyethylene. The organic solvent is used to reduce the temperature required to cause the plastic to develop the required binding characteristic which forms the porous matrix. (Sinha - OEIS)
W74-07201

ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION OF WAVE-INDUCED WATER MOVEMENTS,
FMC Corp., San Jose, Calif. (assignee).
For primary bibliographic entry see Field 8B.
W74-07204

SAFETY DEVICE AGAINST LEAKAGE FROM SHIPS, ESPECIALLY TANKERS,
Svenska Entreprenad A.B. Sentab, Stockholm. (assignee).
A. L. Backstrom.
U.S. Patent No 3,785,321, 3 p, 11 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1014, January 15, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Leakage, *Pollution abatement, *Water pollution control, Water quality control, Ships.
Identifiers: Tankers, Gravity separation.

A ship such as a tanker for the transport of oil and oil products, is provided with a safety device to prevent leakage of the product being stored or transported. The safety device comprises a shield which is flexible and extends along the ship's hull in spaced relation so as to define vertically extending narrow spaces at the inner side of the hull. The narrow spaces open in the bottom region of the ship and shall contain a liquid having the same or a higher density than the transported product. As an example the product may rest on a bed of water at the ship's bottom, water also being present in the said narrow spaces. If, for instance, due to a collision a hole is formed in the ship's hull, the liquid level in the actual narrow spaces will be adapted after the sea level whereby the level of the product in the cargo space takes a balanced position in

which leakage of the product is prevented. As an alternative to water the transported product proper may be contained in the narrow spaces in which case a small leakage may occur if the hull of the ship becomes damaged. (Sinha - OEIS)
W74-07205

OIL RECLAIMING DEVICE FOR REMOVING OIL FROM THE SURFACE OF WATER,
Craftmaster, Inc., Williamsport, Pa. (assignee).
R. P. Smith, Jr.
U.S. Patent No 3,785,496, 3 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1058, January 15, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water quality control, Water pollution control, *Skimming, *Separation techniques, Equipment.

An apparatus for removing oil slicks from the surface of the water includes two independently pivotable booms connected together to form a V. A paddle wheel is connected to the two booms across the open end of the V for skimming the oil off the surface of the water and forcing the oil towards the apex of the V. A sump is located at the apex of the V for collecting the oil forced to the apex of the V by the paddle wheel. A flexible stabilizer bar is connected between the two booms for stabilizing the booms and limiting the maximum amount that the booms may pivot with respect to each other. (Sinha - OEIS)
W74-07206

CONTAINING AND REMOVING OIL SPILLS ON WATER,
Phillips Petroleum Co., Bartlesville, Okla. (assignee).
A. C. Pitchford.
U.S. Patent No 3,785,972, 2 p, 1 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 1173, January 15, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water pollution control, Water quality control, *Separation techniques, *Skimming.

A method is described to contain and then remove oil spills from the surface of a body of water by raising the liquification temperature of the oil to 50-80 deg F above the temperature of the Water. A mixture of wax and a volatile, inflammable substance is applied to the oil spill in sufficient amount to provide on ignition the amount of heat necessary to fuse the wax. The solidified mass may then be removed from the surface. The inflammable substance is selected from hydrocarbons in the kerosene boiling range. Waxes suitable for use include any low temperature melting wax such as the paraffinic waxes, naturally occuring ozocerite, carnauba wax, C12 to C25 alcohols and fatty acids such as stearic or palmitic. Additions of wax in the order of 5 to 50 percent by weight of the oil are effective. A range of 10 to 15 percent by weight of wax added to the oil should be used. (Sinha - OEIS)
W74-07208

METHOD AND APPARATUS FOR COLLECTING A FLOATING LIQUID,
W. P. Kirk, and D. W. Reynolds.
U.S. Patent No 3,788,079, 5 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1743, January 29, 1974.

Descriptors: *Patents, *Oil spills, *Pollution abatement, *Oil pollution, Water quality control, Water pollution control, Equipment, *Separation techniques.

Methods and equipment are described for rapid deployment of a recovery membrane sheet and for subsequently closing or collapsing the sheet to concentrate the oil or unwanted floating liquid into a compact mass. The sheet with weighted periphery is delivered to the site in a compact, folded condition. The edges of the sheet fall and submerge into the surface, confining a quantity of the oil or other unwanted liquid. Further submergence of the peripheral edges is then accompanied by radially inward movements to concentrate the confined substance into a compact mass. The compact mass is retained for subsequent pumping into a receiver vessel. (Sinha-OEIS)
W74-07215

METHOD FOR THE ELIMINATION AND POSSIBLE RECOVERY OF THE FLOATING POLLUTING SUBSTANCES, MINERAL OILS IN PARTICULAR, FROM SHEETS OF WATER AND BOAT FITTED TO THIS AIM,
A. L. deAngelis.
U. S. Patent No 3,788,481, 3 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1850, January 29, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water pollution control, Water quality control, Boats, *Separation techniques, Skimming.

A boat is furnished with one or more chambers having openings to admit water with floating oil layers. Within the chamber where it is sheltered from the action of wind or waves separation takes place. A funnel is submerged at an adjustable distance from the liquid to be removed. A pump sucks the liquid from the funnel(s) and conveys it to a tank where it is decanted. The separated water is discharged into the sea, while the oil is conveyed to another tank for temporary storage. The funnel(s) is connected with a float, the device moves vertically according to the greater or minor boat draft. Vertical slides are arranged at the sides of the funnel to facilitate the proper running of the device lateral shift. (Sinha-OEIS)
W74-07220

METHOD OF REMOVING OIL SPILLS,
Anheuser-Busch, Inc., St. Louis, Mo. Assignee.
J. Teng, J. M. Lucas, and R. E. Pyler.
U. S. Patent No 3,788,984, 3 p, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 918, No 5, p 1972, January 29, 1974.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Pollution abatement, Water quality control, Water pollution control, Sawdust, Adsorption, *Separation techniques.
Identifiers: Carbohydrate fatty acid ester, Cellulose acetate, Cottonseed hulls, Cellulose ester.

A method is described for removing spilled oil from water surfaces without further injuring the environment. A carbohydrate fatty acid ester in powder, fibrous, or granule form is applied to the oil covered surface. The preferred ingredient is cellulose acetate. The additive is non-toxic, biodegradable, water insoluble, and is not degraded by the acids in petroleum fuels. The additive is sprinkled on the surface of the oil coated water and after absorbing many times its weight in oil is easily removed. The picked up oil is easily removed from the cellulose acetate and up to 95% recovery of spilled oil is possible. The cellulose acetate also can be reused. Cottonseed hulls and sawdust as the starting cellulose material are desirable because of low cost and the enhanced oil absorbing character of the resulting acetate. (Sinha-OEIS)
W74-07222

APPARATUS FOR REMOVING SURFACE POLLUTANTS FROM WATER AND OTHER LIQUIDS,
Societe Grenobloise d'Etudes et d'Applications Hydrauliques (France). Assignee.
B. Valibouse, and J. Pichon.
U. S. Patent No 3,789,988, 5 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 919, No 1, p 159, February 5, 1974.

Descriptors: *Patents, *Flotsam, *Oil pollution, *Oil spills, *Pollution abatement, Water pollution control, Water quality control, Equipment, *Separation techniques.

Surface pollutants are collected by utilizing the effect of the relative speed of displacement of water and the floating pollutant. These are led into one or more cyclone chambers through a tangential inlet so as to cause within the chamber, a rotation which creates a whirlpool area in which the lighter pollutant is concentrated. The pollutant is extracted through a fixed pipe whose axis is coincident with that of the cyclone chamber. The centrifuged water, freed of the pollutants is removed through the tip of the cyclone chamber. The equipment may be towed or pushed by a ship, or mounted on or built into a ship or a floating carrier, or placed in a stable position in a river. (Sinha-OEIS)
W74-07223

COMBINED SEWER OVERFLOW SEMINAR PAPERS.
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5D.
W74-07255

STORMFLOW POLLUTION CONTROL IN THE U.S.,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5D.
W74-07256

THE EFFECTS OF HOUSEHOLD SANITARY SYSTEMS ON EFFLUENT PHOSPHATE LEVELS,
Windsor Univ. (Ontario). Industrial Research Inst.
For primary bibliographic entry see Field 5D.
W74-07267

PETROLEUM REFINERY EFFLUENT REGULATIONS AND GUIDELINES.
Environment Canada Environmental Protection Service Regulations, Codes and Protocols Report EPS 1-WP-74-1 January, 1974. 29 p. (Text also in French).

Descriptors: *Oil pollution, *Water quality standards, *Regulation, Liquid wastes, Effluents, *Oil industry, Oil wastes, Toxicity, *Canada, Quality control, Oil, Phenols, Sulfides, Hydrogen ion concentration, Suspended load, Ammonia, Cooling water.

As of November 1973, regulations respecting deleterious substances in liquid effluents from petroleum refineries were annexed to the Canadian Fisheries Act. Specific substances included under these regulations include oil and grease, phenols, sulfide, ammonia nitrogen, total suspended matter, and any substance capable of altering the pH of liquid effluent or once-through cooling water. Simultaneously issued by the Department of the Environment were guidelines respecting acute toxicity of liquid effluents from petroleum refineries and the quality of liquid effluents from existing petroleum refineries. Explanatory notes regarding the regulations and both guideline criteria are included. (Sandoski-Franklin)
W74-07274

STREAM POLLUTION.
For primary bibliographic entry see Field 6E.
W74-07275

SANITARY DISTRICTS FOR SEWAGE DISPOSAL.
For primary bibliographic entry see Field 6E.
W74-07276

WEST VIRGINIA WATER DEVELOPMENT AUTHORITY.
For primary bibliographic entry see Field 6E.
W74-07277

CLASSIFICATION OF WATER AND WATER STANDARDS.
For primary bibliographic entry see Field 6E.
W74-07281

LAW AFFECTING THE QUALITY OF THE MARINE ENVIRONMENT,
T. A. Clingan, Jr.
Miami Law Review, Vol 26, No 1, p 223-254, 1971. 3, 148 ref.

Descriptors: *Water quality control, *Oceans, *Legislation, *International law, Legal aspects, Wastes, Oil pollution, Heat, Nutrients, Sediments, Federal government, Federal Water Pollution Control Act, Rivers and Harbors Act, State governments, Florida, Minnesota, Maine, Water management(Applied).

The author reviews some of the current approaches to the solution of water pollution problems, particularly as they affect the oceans, in order to create a more coherent understanding of the adequacies and shortcomings of present legal remedies. In order to show the great breadth of the problems involved in the study of marine pollution the oceans are examined as a depository of waste, particularly in terms of oil, toxic substances, heat, nutrients, and sediments. The discussion of national regulation of marine pollution is an examination of several major enactments, including the National Environmental Policy Act, the Federal Water Pollution Control Act (as amended), and the Rivers and Harbors Act of 1899. In addition the provisions of certain pieces of typical state legislation in Florida, Minnesota, and Maine are examined to shed light on the operation of federal law. The impacts of international agreements on national law, both in general and in terms of ocean dumping, are discussed. (Widman-Florida)
W74-07282

UNITED STATES V. POT-NETS, INC. (VIOLATION OF RIVERS AND HARBORS ACT),
For primary bibliographic entry see Field 6E.
W74-07287

PROTECTION OF THE ENVIRONMENT.
For primary bibliographic entry see Field 6E.
W74-07289

UNITED STATES V. IRA S. BUSHEY AND SONS, INC. (INJUNCTION AGAINST OIL SPILLS).
For primary bibliographic entry see Field 6E.
W74-07291

THE BITTERSWEET WATERS OF THE LOWER COLORADO,
For primary bibliographic entry see Field 3F.
W74-07292

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
For primary bibliographic entry see Field 6E.
W74-07293

AGANA SMALL BOAT HARBOR, AGANA, GUAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 4A.
W74-07294

SIMULATION--A TOOL FOR WATER RESOURCE MANAGEMENT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6A.
W74-07300

REGIONAL WATER QUALITY MANAGEMENT BY THE GENERALIZED REDUCED GRADIENT METHOD,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W74-07311

ENVIRONMENTAL IMPACT ANALYSIS: AN EXAMINATION OF THREE METHODOLOGIES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W74-07339

AN OIL RECOVERY SYSTEM UTILIZING POLYURETHANE FOAM--A FEASIBILITY STUDY,
Shell Development Co., Houston, Tex. Pipline Research and Development Lab.
R. A. Cochran, J. P. Fraser, D. P. Hemphill, J. P. Oxenham, and P. R. Scott.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-084, $2.35; microfiche from NTIS as PB-231 838 $1.45. Environmental Protection Agency, Technology Series Report No. EPA 670/2-73-084, October 1973. 199 p, 97 fig, 45 tab, 3 ref. EPA Project 15080 HES 68-01-0067.

Descriptors: *Oil pollution, *Oil spills, Water pollution, Incineration, Water pollution control, Separation techniques, Pollution abatement.
Identifiers: *Sorbents, *Oil skimmer, *Polyurethane foam, *Oil spill recovery, Hay blower, Chain-Link belts, Recycled sorbent.

A system has been developed for recovering spilled oil from water surfaces under a wide variety of environmental conditions and for all types of oils. The system is designed to recover oil at rates up to 9,000 gal./hr. This system is based on the use of polyurethane foam, foamed on the job site, as a sorbent for the spilled oil. The foam is recirculated to increase efficiency and to lower unit costs. Equipment needed includes collection booms, an open-mesh chain-link belt for harvesting the oil-soaked sorbent, and a roller-wringer to remove oil and water from the foam. The foam is initially comminuted and distributed onto the water by means of a hay blower (mulcher), and recycled foam is distributed by an open-throat centrifugal blower. Recovered oil and water are transported to shore in large fabric bags for further treatment prior to disposal. Used foam is disposed of by incineration. (EPA)
W74-07341

IN-PLANT, CONTINUOUS HOT-GAS BLANCHING OF SPINACH,
National Canners Association, Berkeley, Calif. Western Research Lab.
For primary bibliographic entry see Field 3E.
W74-07368

USER CHARGES AND INDUSTRIAL COST RECOVERY, DENVER SMSA,
Wilbur Smith and Associates, Denver, Colo.
For primary bibliographic entry see Field 5D.
W74-07370

DEVELOPMENT OF A DECISION ROOM FOR ENVIRONNTAL STUDIES, (FEASIBILITY STUDY),
Datametric C'OR H, McLean, Va.
For primary bibliographic entry see Field 6G.
W74-07371

RESIDUALS IN MANUFACTURE OF PAPER,
Resources for the Future, Inc., Washington, D.C.
For primary bibliographic entry see Field 5B.
W74-07399

POLLUTION CONTROL THROUGH TRAINING, EDUCATION, AND RIGOROUS FOLLOW-UP,
Rolland Paper Co. Ltd., St. Jerome (Quebec).
R. Duquette.
Canadian Pulp and Paper Association, Technical Section, Proceedings, No 2, p D41-43, Oct 1973. 6 fig.

Descriptors: *Pulp wastes, Sewerage, Waste water disposal, Pulp and paper industry, *Canada, *Training, *Education, Employee relations, Leadership, *Personnel management, *Water pollution control, *Pollution abatement, Planning, Industrial wastes, Effluents, Discharge(Water), Discharge frequency.
Identifiers: Rolland Paper Co.(St. Jerome-P.Q.).

The importance of the human factor in meeting water pollution abatement goals is illustrated by the results achieved at Rolland Paper Co. Ltd., St. Jerome, Quebec. Mill employees are given oral and printed instructions on the operation and function of the recovery system. Production data and sewer losses are posted daily and cumulatively. Comparisons of program results vs. goals are sent as reminders to all levels of responsible supervision. (Brown-IPC)
W74-07408

THE PULP AND PAPER INDUSTRY AND THE ENVIRONMENT,
British Paper and Board Makers' Association, London (England).
For primary bibliographic entry see Field 5D.
W74-07411

LOSSES OF INORGANIC NITROGEN FROM AQUATIC SYSTEMS,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-07426

EFFECTIVENESS OF TWO NITRIFICATION INHIBITORS FOR ANHYDROUS AMMONIA UNDER IRRIGATED AND DRYLAND CONDITIONS,
Agricultural Research Service, Pullman, Wash. Soil and Water Conservation Research Div.
V. L. Cochran, R. I. Papendick, and W. M. Woody.
Agronomy Journal, Vol 65, No 4, p 649-653, July-August, 1973. 5 fig, 15 ref.

Descriptors: *Nitrogen, *Nitrification, *Leaching, Ammonia, Nitrogen cycle, Nitrogen fixation, Wheat.

Potassium azide and 2-chlor-6-(trichloromethyl) pyridine were evaluated as nitrification inhibitors for anhydrous NH3 field applied on irrigated and nonirrigated Ritzville silt loam and on nonirrigated Naff silt loam in eastern Washington. Formulations of KN3, N-Serve in liquid NH3, or NH3 alone were applied to fallow soil in midsummer at a rate of 90 kg N/ha. Irrigations were 15 cm of water sprinkler applied 1 day or 2 weeks after fer-

tilizer application, and 10 to 15 cm of water each time at 4, 8, and 13 weeks after NH3 application. The NH3 retention zone was sampled for NH+4 and NO-3 periodically through December for the Naff soil and through February for the Ritzville soil. Both KN3 and N-Serve effectively inhibited nitrification of the applied NH3 on nonirrigated Ritzville soil when temperature and soil moisture were favorable for rapid nitrification. However, KN3 was completely ineffective following irrigation or, for the Naff soil, after rainwater penetrated below the retention zone 2 weeks after N application. (Skogerboe-Colorado State)
W74-07436

SHALLOW DRAIN PERFORMANCE IN A HEAVY SOIL,
Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
For primary bibliographic entry see Field 4A.
W74-07442

NITRATE CONCENTRATIONS IN THE UNSATURATED ZONE BENEATH IRRIGATED FIELDS IN SOUTHERN CALIFORNIA,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
P. F. Pratt, and D. C. Adriano.
Soil Science Society of America Proceedings, Vol 37, No 2, p 321-322, March-April, 1973. 1 fig, 1 tab, 5 ref.

Descriptors: *Drainage, *Nutrient removal, Nitrogen, Leaching, Denitrification, Crop response, Crop production, *California, *Nitrates.

Nitrate concentrations in the drainage water of the unsaturated zone beneath the soil-root zone were predicted from data for N inputs, N removal in harvested crops, and the drainage volume. Ratios of these predicted values to measured values were related to the volatilization losses or unaccounted-for inputs expressed as a fraction of the excess N defined as the N input minus N removal in harvested crops. Volatilization losses or unaccounted-for inputs were calculated as known inputs minus removal in harvested crops minus that removed from the soil-root system by leaching. (Skogerboe-Colorado State)
W74-07445

APPLICATION OF A LARGE SCALE NONLINEAR PROGRAMMING PROBLEM TO POLLUTION CONTROL,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5D.
W74-07461

APPLICATION OF NONLINEAR PROGRAMMING TO WATER QUALITY CONTROL,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5D.
W74-07462

MORE HEAT THAN LIGHT: THERMAL POLLUTION VERSUS HEAT ENERGY UTILIZATION,
Snessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 5B.
W74-07465

HERBIVOROUS FISH FOR AQUATIC PLANT CONTROL,
Waterways Experiment Station., Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W74-07470

RESPONSE OF AQUATIC WEEDS TO LASER RADIATION,
Athens Coll., Ala. Dept. of Biology.
R. W. Couch.
Available from the National Technical Information Service as AD-754 590, $3.00 in paper copy, $1.45 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss. Aquatic Plant Control Program, Technical Report 2, December 1972. 50 p, 17 fig, 8 tab, 34 ref. DACW01-69-C-0020-P00005.

Descriptors: *Aquatic weed control, *Radiation, Water hyacinth, Mortality, Aquatic plants, Plant growth, Alligatorweed.
Identifiers: *Laser radiation, Duckweed, Water lettuce, Water chestnut.

Results of experiments initiated to determine effect of carbon dioxide-laser energy (10.6 microns) on aquatic weeds, principally water hyacinths, are reported. Growth of water hyacinths and duckweed was inhibited. Irradiation levels as low as 0.3 J/sq cm significantly reduced water hyacinth growth when irradiating individual plants. Under group irradiations, where there was more crowding, shading, etc., radiation levels of the magnitude of 20-50 J/sq cm may be necessary to reduce growth significantly. Carbon dioxide-laser radiation of 10 J/sq cm significantly reduced duckweed growth. Laser energy seems to interfere with normal photosynthetic pigment production in water hyacinths. This interference may be via a mechanism that overloads the photoactivation system responsible for stimulating development of plastids from proplastids. The proper design for a field-study involving the effects of carbon dioxide-laser radiation on water hyacinths has been achieved. Neither alligator weed growth nor water chestnut was measurably inhibited by laser radiation. Inhibition by insect larvae rendered laser effects on water lettuce growth inconclusive. A neodymium laser (1.06 microns wavelength) possibly has potential for inhibiting water hyacinth growth. (Jones-Wisconsin)
W74-07475

BIOLOGICAL INVESTIGATIONS OF NOXIOUS COELENTERATES AND CTENOPHORES IN COASTAL NORTH CAROLINA,
North Carolina Univ., Morehead City. Inst. of Marine Sciences.
For primary bibliographic entry see Field 2L.
W74-07479

INVESTIGATION OF THE BIOLOGY AND CONTROL OF NOXIOUS COELENTERATES OCCURRING IN THE COASTAL WATERS OF PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.
For primary bibliographic entry see Field 2L.
W74-07480

DISEASES OF POND FISHES,
For primary bibliographic entry see Field 8I.
W74-07481

SELECTION AND OPERATION OF SMALL WASTEWATER TREATMENT FACILITIES - TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W74-07485

LAWS AND REGULATIONS OF POLLUTION AND NAVIGATION IN PACIFIC NORTHWEST ESTUARIES,
Coast Guard, Portland, Oreg.
R. F. Malm.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 87-92 (1972).

Descriptors: *Coasts, Law enforcement, *Regulation, *Legislation, Navigation, *Pacific Northwest U.S., Estuaries, Safety, Environment, Water quality control, Boating, Harbors, Water pollution sources.
Identifiers: Coast Guard.

The Coast Guard operates within five operational program areas directly related to law enforcement responsibilities. The field level execution of these programs is carried out by shore and floating units. The Coast Guard establishes, maintains, and operates aids to maritime navigation to facilitate navigation and prevent disasters, collisions, and wrecks. Merchant marine safety regulations provide for inspection of merchant vessels, approval of vessel plans and equipment, licensing and certification of merchant marine officers and seamen, documentation of United States' vessels, and containment and holding of hazardous goods in maritime transportation. Laws and regulations aimed at reducing accidents, injuries, and fatalities and improving the environmental quality related to the operation of pleasure craft are enforced. It also enforces laws and regulations designed to safeguard vessels, harbors, ports, and waterfront facilities. The detection, prevention, abatement, and elimination of pollution in the marine environment is the purpose of the laws and regulations enforced within the scope of the marine environmental protection. Protection is provided for large spills but most of the activity is directed towards the multitude of small daily spills. (See also W74-07491) (Jones-Wisconsin)
W74-07499

A NOTE ON THE USE OF SPECTRAL ANALYSIS TO DETECT LEADS AND LAGS IN ANNUAL CYCLES OF WATER QUALITY,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 7C.
W74-07522

ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple, Jr.
National Science Foundation, RANN Program, January 1974, 42 p, 9 fig, 79 ref.

Descriptors: *Environment, *Environmental effects, *Ecology, *Social aspects, *Biology, Ecosystems, *Economics, Value, Recreation, Welfare(Economics), Water quality, Utilities, Evaluation, Social values.
Identifiers: *Environmental quality, Anthropology.

A state-of-the-art analysis is presented of the many approaches to evaluating environmental quality, with particular reference to water-related environments. Besides the usual engineering, economic, and systems analysis methodology, consideration is given to a wide spectrum of related methodology and concepts, including biological, anthropological, religious, aesthetic, philosophic and general literary writings. A number of approaches are shown to be basically inadequate or logically without merit. It is concluded that the categorization of environmental quality as 'recreation' or 'aesthetic values' is altogether too narrow. Men and especially children have a basic need for contact with natural environment, which need is based upon genetic characteristics. Although there are many different approaches and different points of view regarding environmental quality, the problem of evaluating it is not an insuperable one. Many of the relevant parameters are possible of description and some of them are evaluable in money terms. As regards others, physical standards can be set for achieving given social objectives, such as providing bathing facilities or nature trail walks for a given population. The main objective is that of providing (or maintaining) an outdoor environment suitable for all

men's enjoyment and psychic health; and other stated objectives, with their varied expressions, are surrogates or supplements, rather than alternatives. The basic environmental objective is not a categorical imperative but is subject to tradeoffs with other social goals and with marginal economic advantages, on terms which are capable of determination, although just beginning to be known.
W74-07533

DETERMINATION OF OIL CONCENTRATION AND SIZE DISTRIBUTION IN SHIP BALLAST WATERS. METHOD AND REPRESENTATIVE RESULTS,
Hydronautics Inc., Laurel, Md.
For primary bibliographic entry see Field 5B.
W74-07564

RECOVERY OF ARSENIC BY DRY ASHING FROM ANIMAL TISSUE FORTIFIED WITH ORGANOARSENICALS OR ARSENIC TRIOXIDE,
Salsbury Labs., Charles City, Iowa, Pharmaceutical Development and Analysis Dept.
For primary bibliographic entry see Field 5A.
W74-07573

BACTERIA-ASSIMILABLE ORGANIC COMPOUNDS, PHOSPHATE, AND ENHANCED GROWTH OF BACTERIA-ASSOCIATED BLUE-GREEN ALGAE,
Cincinnati Univ., Ohio. Tanners' Council Lab.
For primary bibliographic entry see Field 5C.
W74-07587

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

RESOURCE MANAGEMENT DECISIONS: EXTERNALITIES AND PUBLIC POLICY,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
E. N. Castle.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon, Oregon Agricultural Experiment Station, Special Report 348, February 1972. p 105-116, 1 tab. WP-00107.

Descriptors: *Decision making, *Water pollution control, *Economic impact, Regional economics, Optimization, Recreation, Direct benefits, Indirect benefits, Sport fishing.
Identifiers: *Yaquina Bay(Ore.).

Resource quality management cannot be entrusted to private decision making as it is a problem for public policy. The Yaquina Bay, Oregon study provides a classic illustration of public policy issues in the pollution problem. The construct of judging policy on the basis of impact on 'net national benefit' leads to the development of the 'basin-wide firm' and permits the choices of policies that will maximize the economic return from the resources of the area. The value of this tool is that it provides for the judgement of private and public decisions and for the use of such institutional devices as taxes and subsidies. One of the sources of uncertainty of concern in the decision context relates to the changes that will eventually occur with the passage of time; some decisions are irreversible or can be reversed only at very high cost. In the case study estimates of economic activities affected by the paper mill measurements were made only of those activities where a direct causal relationship was evident. Variables included are direct and indirect benefits of recreation, direct benefits of the paper mill, indirect benefits resulting from industrial activity which causes pollution, and cost of pollution control. (See also W74-07142) (Auen-Wisconsin)
W74-07148

A COMPUTER SIMULATION MODEL FOR FLOOD PLAIN DEVELOPMENT. PART II: MODEL DESCRIPTION AND APPLICATIONS,
INTASA, Menlo Park, Calif.
N. V. Arvanitidis, J. Rosing, D. P. Petropoulos, C. H. Jolissaint, and J. L. Poage.
Available from the National Technical Information Service as AD-765 499; $9.75 in paper copy, $1.45 in microfiche. Final report IWR 73-1, Army Engineer Institute for Water Resources, November 1972. 155 p, 32 fig, 40 tab, 22 ref. DACW07-72-C-0012.

Descriptors: *Flood plains, Management, *Simulation analysis, *Computer models, Economic efficiency, Benefits, *Flood protection, *Land use, Evaluation, Alternative planning, Optimization, Flood damage, Economic rent, Costs, Systems analysis.
Identifiers: *Connecticut River Basin, Allocation models.

Presented is a computer simulation model for the evaluation of national economic efficiency benefits of various levels of flood protection and alternative land use plans. A description of the model, referred to as SIMULATOR, and the results of its application to Reach 13 of the Connecticut River Basin are given. The model has three major components: (1) calculation of flood damages and economic rent components; (2) allocation of land use requirements; and (3) benefit calculation based on locational advantage and damage reduction. The main components describing locational advantages are differences in flood damages, fixed area development cost, site development cost, transportation cost, amenity values and social environment effect. The land use allocation model provides a completely independent optimization procedure. In the SIMULATOR, implicit assumptions are kept to a minimum; data collection efforts are reduced by using results from sensitivity studies. The study area and dummy location are defined so as to limit the scope. Results show that damage reduction benefits to existing and future activities from additional protection through upstream reservoirs account for 80% of total benefits. (See also W73-02944) (Bell-Cornell)
W74-07296

INTERDISCIPLINARY MODELING IN THE ANALYSIS OF THE SALINITY PROBLEMS OF THE SAFFORD VALLEY,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5B.
W74-07297

NONLINEAR PROGRAMMING IN RIVER BASIN MODELING,
Calgary Univ. (Alberta). Faculty of Business.
For primary bibliographic entry see Field 5B.
W74-07298

FLOOD PROOFING DECISIONS WITH UNCERTAIN EVENTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
C. E. Willis, and P. Alkiku.
Water Resources Bulletin, Vol 10, No 2, p 295-303, April 1974. 1 fig, 1 tab, 5 ref.

Descriptors: *Floodproofing, *Economic efficiency, *Alternative planning, *Constraints, *Risks, Flood damage, Estimating, *Benefits, Costs, Probability, Historic floods, Computers, Connecticut River, Mathematical models, Systems analysis.
Identifiers: Net benefits, Partial equilibrium framework, Means, Variances, Flood depth, Density functions, Standard deviation.

Adding flood proofing to other structural and nonstructural flood damage reduction measures widens the choice among existing alternatives for decision makers and consequently enables the possibility of improved expected net benefits from an overall flood damage reduction scheme. But planners are interested in more than just expected values of net benefits; the inherent riskiness (uncertainty) of various alternative plans must be considered as well. By focusing on a constrained (economic) efficiency criterion, a partial equilibrium framework is developed for purposes of estimating means and variances of a measure of net benefits from flood proofing. Both benefits (damage reductions) and flood proofing costs are assumed linear in terms of flood depth, where depth is stochastic with probabilities assigned to various states in accordance with historical data. In addition to treating flood depth in a probabilistic manner, the parameters of the linear benefit and cost functions are assigned density functions permitting the uncertainty to be reflected in the magnitude of the calculated standard deviation. The model is applied to selected communities in the Connecticut River Basin and sample computer results are provided. (Bell-Cornell)
W74-07299

SIMULATION--A TOOL FOR WATER RESOURCE MANAGEMENT,
Hydrocomp, Inc., Palo Alto, Calif.
A. Donigian, Jr., and W. H. Waggy.
Water Resources Bulletin, Vol 10, No 2, p 229-244, April 1974. 12 fig, 12 ref.

Descriptors: *Water quality, *Planning, *Management, *Simulation analysis, *Frequency analysis, Project planning, Damages, *Computer models, Evaluation, Economic efficiency, Digital computers, Probability, Methodology, Optimum development plans, Benefits, Systems analysis.
Identifiers: Economic analysis, Probabilistic analysis.

Water resource projects must be evaluated in economic terms in order to maximize the efficient utilization of the resources available for water resource management. A knowledge of the frequency of occurrence of the events being studied is necessary to fully make use of the advantages of economic evaluation in planning. (Frequency analysis, used widely in flood control and water supply, is here adapted to water quality planning.) Mathematical simulation for project evaluation and management is presented; the process involves the grouping of mathematical expressions into a computer model which duplicates the essential behavior of the water resource system. Presented is the Hydrocomp Simulation Program (HSP), a sophisticated model, for use on digital computers to simulate hydrologic and water quality processes in natural and man-made systems. In the methodology presented, the continuous, dynamic model develops frequency curves for various water quality criteria; damage-frequency curves are derived. The procedure estimates expected damages from the frequency distribution of adverse water quality events. The basic theory of probabilistic (frequency) analysis and the method of economic evaluation are presented, followed by a description of the HSP. Results from the Denver Regional Water Quality Management Study are discussed as an example of the use of frequency analysis for economic evaluation of water quality management. (Bell-Cornell)
W74-07300

IPSWICH RIVER BASIN MODEL STUDY,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 6D.
W74-07302

OPTIMUM DESIGN HEIGHT OF COFFERDAMS,
Imperial Government of Iran, Tehran. Plan Organization.
For primary bibliographic entry see Field 8A.
W74-07304

A MODEL OF IRRIGATED AGRICULTURE AND REGIONAL DEVELOPMENT IN SOUTHERN ARGENTINA: THE RIO NEGRO BASIN,
Resources for the Future, Inc., Washington, D.C.
D. A. Fitchett.
The Annals of Regional Science, Vol 8, No 1, p 14-34, February 1974. 1 fig, 7 tab, 10 ref.

Descriptors: Agriculture, *Irrigation efficiency, *Linear programming, *Alternative planning, *River basins, *Economic impact, Optimization, Investment, Discount rates, Costs, Water demand, Mathematical models, Systems analysis.
Identifiers: *Argentina(Rio Negro basin), Economic expansion.

Linear programming is used to investigate some of the characteristics of alternative rates of expansion of the irrigated agricultural economy of the Rio Negro basin in southern Argentina over a twenty-year period. While essentially a demand-led model, expansion rates can be imposed and the economic impact of such suboptimizing behavior then compared to the optimal outcomes. Presented is a multiperiod linear programming model in which both farm and social infrastructure investments in a given period have an impact on both output and physical and human resource availabilities in subsequent periods. These activities give rise to time streams of costs and returns which are discounted at alternative discount rates to observe the behavior of the model under differing assumptions as to the proper rate. An analysis of the outcomes of model application indicates that the higher rates of expansion of irrigated agriculture in the basin are excessive and an economically optimal rate would be relatively modest. An attempt is made to relate this outcome to approximate overall labor force and population levels in the Rio Negro basin in the next two decades. (Bell-Cornell)
W74-07306

PLANNING AND OPERATIONAL STUDIES IN THE INTEGRATED USE OF DESALINATION. CASE STUDIES FOR CYPRUS AND JERSEY,
Water Research Association, Marlow (England).
For primary bibliographic entry see Field 3A.
W74-07308

CAPITAL COST MINIMIZATION OF DRAINAGE NETWORKS,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07309

A SYSTEMS ANALYSIS OF WATER QUALITY SURVEY DESIGN,
Clemson Univ., S.C. Coll. of Engineering.
For primary bibliographic entry see Field 5B.
W74-07310

REGIONAL WATER QUALITY MANAGEMENT BY THE GENERALIZED REDUCED GRADIENT METHOD,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W74-07311

WATER AND EFFLUENT TREATMENT PLANTS - COST CONSIDERATIONS AND CLIENT, CONTRACTOR, CONSULTANT RELATIONSHIPS, THE CONSULTANT'S VIEW,
For primary bibliographic entry see Field 5D.
W74-07312

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-07334

NETWORK APPROACH TO MANAGEMENT OF CONJUNCTIVELY OPERATED GROUND WATER - SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07335

PARAMETER IDENTIFICATION IN FIELD PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 7C.
W74-07428

PRODUCTION FUNCTION THEORY FOR USE IN OPTIMAL PLANNING DECISIONS,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5D.
W74-07460

APPLICATION OF A LARGE SCALE NON-LINEAR PROGRAMMING PROBLEM TO POLLUTION CONTROL,
California Univ., Los Angeles.
For primary bibliographic entry see Field 5D.
W74-07461

APPLICATION OF NONLINEAR PROGRAMMING TO WATER QUALITY CONTROL,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5D.
W74-07462

ENVIRONMENTAL PLANNING: AN ECONOMIC ANALYSIS. APPLICATIONS FOR THE COASTAL ZONE,
Clemson Univ., South Carolina. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 6B.
W74-07534

6B. Evaluation Process

A STUDY OF POTENTIAL INSTITUTIONAL ARRANGEMENTS FOR WATER QUALITY AND WATER RESOURCES (QUANTITY) PLANNING AND MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
L. B. Dworsky.
Available from the National Technical Information Service as PB-231 557, $10.75 in paper copy, $1.45 in microfiche. Technical Report No. 83, March 1974. 533 p. OWRR C-1196(No 1963) (3). 14-01-0001-1963.

Descriptors: *Institutions, *Water quality control, *Hudson River, River Basin Commissions, Behavior, Political aspects, Water management(Applied), *Water policy, *New York, *Planning, *Management, Water supply.

Potential arrangements for water quality-quantity management institutions to meet future needs are examined. Part 1 describes specifications for water quality and integrating water quality - quantity planning. Part 2 proposes factors (25) for evaluating water management institutions; traces the history and describes nine types of institutions; examines eight case studies (Missouri and Columbia interagency committees, New England River Basin Commission, Hudson River Valley Commission, new concepts for River Basin Organization, Water Quality Management strategies for the Holston River Basin and the Great Lakes, and Multistate Regionalism). Conclusions show that institutional development has grown slowly out of the nation's experience; and suggest the beginning of a focus on selected institutions. Part 3 describes the Hudson River Basin, examines attempts, management institution designs, presents papers clarifying Hudson Basin problems, and concludes with no specific organizational plan but rather ideas to help reach a useful decision. Part 4 proposes synoptic and incremental water resources planning processes as the methods of choice, reviews the ideas used to strengthen the Corps of Engineers role in water quality planning, and assesses the value of ideas developed by this research project in relation to PL 92-500, the Federal Water Pollution Control Act.
W74-07051

COAL-ENERGY DEVELOPMENT IN THE NORTHERN GREAT PLAINS.
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6D.
W74-07056

DETERMINANTS OF USE OF WATER-BASED RECREATIONAL FACILITIES,
George Washington Univ., Washington, D.C. Dept. of Economics.
M. A. Holman, and J. T. Bennett.
Water Resources Research, Vol 9, No 5, p 1208-1218, October 1973. 3 tab, 10 ref.

Descriptors: *Recreation demand, Reservoirs, *Motivation, *Regression analysis, Econometrics, Forecasting, Use rates, Recreation, Planning, *Texas.
Identifiers: *Reservoir usage, *Dallas-Fort Worth Metropolitan Area.

An econometric model is developed to explain the relationships between the use of various facilities at outdoor recreation sites and 15 variables that measure use characteristics of those areas. Eight reservoirs operated by the U.S. Army Corps of Engineers in the Dallas-Fort Worth metropolitan area were used in the case study. Fifteen separate regressions were computed with each of the measures of use as the dependent variable. The stepwise regression procedure entered the independent variables one by one in the order of their contribution to the dependent variable. The variables were grouped into classes. A relative ranking of the importance of each class was based on the number of times the variables in that class entered the regression and the level of significance. In order of decreasing importance, the relative rankings were: distance; season (time of year and weekend/weekday); fees; population, a measure of demand potential; facilities provided at the site; and quality of the reservoir environment, as measured by the degree of commercialization. (Hoffman-North Carolina)
W74-07058

TECHNOLOGY TRANSFER IN THE MARINE ENVIRONMENT OF LONG ISLAND,
Center for the Environment and Man, Inc., Hartford, Conn.
W. V. McGuinness, Jr., R. Pitchai, and G. M. Northrop.
Available from the National Technical Information Service as COM-73-11889, $3.50 in paper copy, $1.45 in microfiche. CEM Report 4133-475 prepared for the Marine Resources Council, Nassau-Suffolk Regional Planning Board, Hauppauge, N.Y. February 1973. 48 p, 3 fig, 6 tab, 4 append.

Descriptors: Research and development, *Management, *Research priorities, *Water management(Applied), Coasts, Technology, Coastal engineering, Shore protection, Administration, *New York, Comprehensive planning, Environmental control, Environment, Environmental effects, Dredging, Channel improvement, Waste water disposal, Waste water treatment, Water pollution, Water quality, Wetlands.
Identifiers: *Coastal zone management, *Technology transfer, *Long Island(NY), Nassau Co.(NY), Suffolk Co.(NY), Coastal protection.

Actions taken by the Regional Marine Resources Council to improve the relevancy of research to the solution of high-priority coastal zone management problems in Nassau and Suffolk Counties of Long Island, New York, are described. Focus is on the marine environment of the two-county area with 2.5 million inhabitants which swells to as many as 10 million during the summer. Eventually the decision must be made (1) for increased management of the environment - including its social, economic and natural components - or (2) for continuing primary dependence upon a more laissez-faire pattern. The Council and the Center for the Environment and Man, Inc. (CEM) combined efforts to create public, governmental, and institutional awareness of high-priority problems, assess the state-of-the-art of research, recommend additional research, and propose tentative guidelines for solving problems. These purposes require a transfer of technology from the researcher to government officials, the public, and planners. CEM selected four high-priority management problems, (1) integrating water treatment and wastewater disposal; (2) coastal protection and stabilization; (3) dredging and spoil disposal; and (4) wetlands, to which technology transfers are directed. This transfer can be attained by adopting a priority-oriented research program, making the research community aware of policy formulators' needs for information, making policy formulators aware of findings from the research community, and molding these three into a systematic interplay of guideline reformulations, relevant research readjustment, and prompt incorporation of research findings into policies and plans. (Grden-North Carolina)
W74-07059

PROCEDURES AND PROGRAMS TO ASSIST IN THE ENVIRONMENTAL IMPACT STATEMENT PROCESS,
California Univ., Berkeley. Inst. of Urban and Regional Development.
J. C. Sorensen, and M. L. Moss.
Available from the National Technical Information Service as COM-73-11033, $3.00 in paper copy, $1.45 in microfiche. April 1973. 38 p, 56 ref, 2 append. NOAA SG 04-3-158-22, 04-3-158-45.

Descriptors: *Federal project policy, Environment, *Project planning, *Environmental effects, Ecosystem, Management, Feasibility studies, Project purposes, Project post-evaluation, Decision making, Future planning, Environmental control, Land use, Regional planning, Resources development.
Identifiers: *National Environmental Policy Act, *Environmental Impact Statements, Impact assessment, Impact identification, Land use planning, Ecological effects.

The environmental impact statement, required by the National Environmental Policy Act and state acts, considers environmental concerns in planmaking and project proposals. Whether this tool will fulfill its potential depends on the development of procedures to prepare and review the impact statement. Impact assessment is a three-stage process (1) identifying environmental, social, and economic conditions possibly changed by the project (2) predicting the intensity and spatial dimension of the changes and (3) evaluating costs and benefits of the conditional changes. Assessment methods are discussed in relation to these stages. Impacts to be considered and methods of impact identification, including networks, matrices, and project-type checklists, are presented. The degree and dimension of change is difficult to predict due to insufficient information, failure to use existing data, and lack of predictive methods. Questionable projects should be rejected when environmental effects cannot accurately be predicted. Methods for evaluation include aggregate vs. discrete measurement, public review, plan compliance-conflict, cost-benefit analysis, and cost-approval monitoring. Present assessment procedures must be analyzed continuously and new methods sought out and tested. (Grden-North Carolina)
W74-07061

URBAN IMPACTS OF RURAL RESOURCE DEVELOPMENT EXPENDITURES IN THE INTERLAKE AREA OF MANITOBA,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
J. A. MacMillan, and C-M. Lu.
Research Report No. 7, 1973. 80 p, 4 fig, 24 tab, 6 append.

Descriptors: *Canada, *Economic impact, *Income distribution, *Input-output analysis, *Regional economics, Regional development, Industrial production, Public services, Productivity, Economic prediction, Resource allocation, Farm management, Regional analysis, Resource development, Rural areas, Marketing, Drainage, Land clearing.
Identifiers: Interlake Area(Manitoba-Canada), *Rural development, Trade center development, Economic activity, Resource development alternatives.

Future development of small areas such as the Interlake Area of Manitoba, Canada, is determined by the volume of export sales by area businessmen. The objective of the Interlake Area development plan is to improve income levels and job opportunities. Measurements of flows of economic activity among rural trade areas, trade centers, and metropolitan centers outside the area are therefore needed. If rural trade center development is a priority, alternative strategies must be assessed, including rural resource development programs (drainage, land clearing, and farm management training), upgrading public services such as education, and incentives to industrial location. Alternative methods for assessing strategies and providing estimates for resource development and public service programs are developed. Job and income impacts of resource development alternatives have been determined by input-output tables and employment-output functions. Farm management training has the greatest annual impact on income per unit of government expenditures, followed by land clearing, drainage, and educational expenditures. The methodology does not measure price or efficiency effects of the programs, since the focus is on geographical distribution of short-run program impacts. (Grden-North Carolina)
W74-07068

A FRAMEWORK FOR ECONOMIC PLANNING OF WATERSHED DRAINAGE,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 4A.
W74-07069

PUBLIC INVESTMENT CRITERIA: APPLICATION TO A PROJECT IN THE SOURIS RIVER BASIN,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
E. A. Gardiner.
Research Report No. 8, 1973. 65 p, 5 fig, 22 tab.

Descriptors: *Canada, Economic justification, *Irrigation efficiency, Irrigation effects, *Water utilization, *Land use, *Regional planning, Irrigation districts, Irrigation programs, Irrigation, Economic efficiency, Benefits, Costs, *Investment, Economic feasibility, Economic impact, Economic justification, Cost-benefit analysis, Direct benefits, Employment opportunities, Land resources, Project planning, Resources allocation.
Identifiers: Manitoba(Canada), Coulter-Patterson Project(Manitoba-Canada), *Souris River Basin(Manitoba-Canada), Public investment, Income redistribution.

Public investment criteria are applied to the Coulter-Patterson Project, an irrigation project proposed for southwestern Manitoba's Souris River Basin. Although efficient in that irrigation benefits exceed project construction, operating, and maintenance costs, it is not an effective instrument for an income redistribution objective. It distributes benefits more in favor of wealthy farmers than poorer ones. From the regional view, all direct irrigation benefits accrue to the local region. However, secondary benefits are temporary. In addition, water used in the project must be considered just as if it was a purchased input, since there is an opportunity cost for the large amount of water used in irrigation that can no longer be used elsewhere. Data deficiencies handicapped the study; regional data on net farm income, information about the unemployment situation of the region, and development of regional multipliers are needed. While the study evaluates the income redistribution objective, a multiple-objective framework must exist to approximate trade-offs between objectives and to complement the revenue-expenditure picture. (Grden-North Carolina)
W74-07070

PLANNING AND DEVELOPING WATERFRONT PROPERTY,
Rick Engineering Co., San Diego, Calif.
W. B. Rick.
Urban Land Institute, Washington, D.C. Technical Bulletin 49. June, 1964. 24 p, 4 photo.

Descriptors: *Marinas, *Urbanization, *Harbors, Recreation, *Recreation facilities, *Boating, California, Florida, Economic feasibility, Value, Land use, Planning, Coordination, Financing, Operating costs, Operation and maintenance, Property values.
Identifiers: *Waterfront development, Waterfront property, Real estate, Residential development, Land value, Intergovernmental coordination, Ft. Lauderdale(Fla), San Diego(Calif), Boca Raton(Fla), Newport(Calif), Commercial operation.

Waterfront facilities involve a fixed location with high capital investment in a rapidly changing market situation. Tides, currents, and other water hazards complicate development. Because of the size of the projects and high cost level most recreational waterfront development is assisted or underwritten by government, especially the federal government. River and harbor development is generally viewed from a broad benefit to cost ratio. The role of private capital ranges from leasing and operating on prepared public-owned waterfront to dredging and developing water and land communities. Waterfront real estate not adversely affected by industry or the elements commands premium prices, especially when suitable for recreation use. Selected examples of waterfront development reviewed include Lake San Marcos, a new community developed on 1500 acres of semi-arid lands in San Diego County, California around a formerly unkempt reservoir, Royal Palm Yacht and Country Club, a residential, recreational development just south of Boca Raton, Fla., Newport Shores, a Newport, Calif., residential development of 435 homes on 40 acres on the old Santa Ana River, Bahia Mar Yachting Center, a complete marina development at Ft. Lauderdale, Fla., and Islandia, a marina on Mis-

sion Bay, San Diego, Calif. Commercial marina operation is also examined in detail. (Edwards-North Carolina)
W74-07072

PROGRAM DEVELOPMENT PLAN FOR THE MESA-NEW YORK BIGHT REGIONAL PROJECT.
Westinghouse Oceanic Div., Annapolis, Md.
Available from the National Technical Information Service as COM-73-10756; $6.00 in paper copy, $1.45 in microfiche. Final Report prepared for Office of Marine Resources, September 1, 1972. 358 p, 8 fig, 12 tab, 116 ref, 8 append. 2-35461.

Descriptors: *Regional analysis, *Optimum development plans, Water resources development, Management, Environment, *Environmental control, *Model studies, New York, Projects, Habitats, Water treatment, Environmental effects, Ecosystems, Ecology, Systems analysis, Regional development, Research and development, Marine animals, Marine biology, Marine plants, Oceans, Aquatic life, Marine geology, Research priorities, Methodology.
Identifiers: *New York Bight, Marine Ecosystem Analysis Project(MESA), *Program development plan, Regional planning, Technical integration.

The New York Bight is a coastal zone region where past decisions have had undesirable impacts on the marine environment, but where pressing needs forced decisions regardless of availability of complete data. Both scientific and administrative mechanisms are required to direct action. The Marine Ecosystem Analysis (MESA) Program is developing a plan for such decision-making. An initial conceptual model ecological data, continually updated, is used. With this model, further data requirements can be identified. Specific technical goals for the five-year period include provision of an environmental data base, systematic analysis of the source and fate of pollutants, development of procedural models, and establishment of regionalized monitoring systems. Results must be oriented to issues pressing for action, so technical integration, user-directed orientation, organizational participation, and adequate feedback will enhance project utility. As the project unfolds, benefits derived will include deepened understanding of the ecosystem, development of mechanism for airing and resolving issues, development of a comprehensive and interdisciplinary mechanism to acquire data, improved access to data, and improved coordination of public and private resources to meet common goals. (Grden-North Carolina)
W74-07078

MEASURES TO REDUCE WATER CONSUMPTION IN SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 6D.
W74-07079

PROPOSED WATER SUPPLY PROJECTS FOR SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 6D.
W74-07080

STUDY DESIGN. SURFACE DRAINAGE PROGRAM, MADISON, ST. CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 4A.
W74-07083

POPULATION, LAND USE AND LIVESTOCK COMPOSITION IN INDIA AND ITS ARID ZONE,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 3F.
W74-07105

ARIZONA STATE LAKE IMPROVEMENT FUND PLAN.
Arizona Outdoor Recreation Coordinating Commission, Phoenix.
1973. 90 p, 27 tab, 6 ref.

Descriptors: *Lakes, *Arizona, *Safety, *Recreation facilities, *Boating regulations, Boats, Boating, Water sports, Artificial lakes, Planning, Project planning, Taxes, Water resources development.

The Arizona Outdoor Recreation Coordinating Commission was required by law to determine boating needs in Arizona, and to be of guidance in the granting of funds derived from motorboat fuel taxes and the lieu tax paid annually by boat owners into the State Lake Improvement Fund. Based on allocations for various safety projects, boat-oriented recreation improvements, and lake construction, the plan presented identifies the most urgent need as one to make boating waters safer. Immediate priorities include construction of first-aid stations on each major lake, provision of patrol boats for boating law enforcement agencies, and development of additional areas in the water-short southern part of the State where the second highest registration of boats in the State exists. In making recommendations for allocation of funds, factors considered included description of spatial distribution of Arizona's registered watercraft, patterns of participation in boating activities on a statewide basis, an inventory of related facilities at the most preferred boating waters, an estimate of preference for boating-related facilities, and an estimate of the growth of registered watercraft in Arizona in the decade 1970-1980. These general factors, serving as a matrix for the plan, can be used to determine a project priority system for rating proposed State Lake Improvement Fund projects. (Paylore-Arizona)
W74-07108

BETHANY RESERVOIR RECREATION DEVELOPMENT PLAN.
California State Dept. of Water Resources, Sacramento.
Bulletin No 117-12, December 1970. 15 p, 1 fig, 3 tab.

Descriptors: *Recreation demand, *Reservoirs, *Recreation facilities, *Cost-benefit analysis, California, Water sports, Boat-launching ramps, Fishing, Camp sites, Reservoir operation, Capital costs, Operating costs, Replacement costs.
Identifiers: *Bethany Reservoir(Calif.), Recreation development plans.

A recreational development plan for Bethany Reservoir, located in the northeastern hills of Alameda County, California is examined. The reservoir, completed in 1967, presently serves as a forebay for the South Bay Pumping Plant and Aqueduct, and is a regulating reservoir for the California Aqueduct. Recreational facilities proposed for construction during the 1975-1981 period include a boat launching ramp, 40 picnic units, 40 camping units, 2 boat-in areas, 2 fishing access sites, a sandy beach, additional roads, parking facilities, water supply, sanitary and electrical facilities. Estimated capital cost is $800,000 (excluding land) with replacement costs estimated at 3.5% of annual capital costs and operating and maintenance costs assumed to about 30 cents per recreational day. The facilities are expected to provide 25,000 annual recreational days starting in 1976 and increase to a maximum of 70,000 by 1981. Total recreational benefits were determined by multiplying $1.72--a unit value which considers the variety and quality of the recreational experiences and the aesthetics of the site--times the daily estimated use. The present value of the stream of recreational benefits from this proposed development for the 50-year analysis period was estimated to be $1,885,000. (Schroeder-Wisconsin)
W74-07127

LAKE PERRIS RECREATION DEVELOPMENT PLAN.
California State Dept. of Water Resources, Sacramento.
Bulletin No 117-1, October 1972. 11 p, 1 fig, 2 tab.

Descriptors: *Cost-benefit analysis, *Recreation facilities, *Reservoirs, California, Boat-launching ramps, Recreation demand, Multi-purpose projects, Camp sites, Capital costs, Operating costs, Replacement costs.
Identifiers: *Lake Perris(Calif), Recreation development plans.

A proposed reservoir, Lake Perris, to meet water supply requirements and recreation demand in California is described. The lake, located 18 miles southeast of Riverside, will represent the southernmost reservoir in the State Water Project and will provide both water supplies and recreational activities. Included in the development plans are riding and hiking trails, boat launching facilities, a waste disposal systems, camping and picnic units, beaches, and trailer parking facilities. Minimum use facilities which include boat launching, beaches, car packing, and minimum sanitation are expected to be completed by 1973 and will accommodate 650,000 recreation-day users annually. By 1980 completed facilities should provide for 2,995,000 recreation-day users annually. Capital costs to complete the proposed development are estimated at $38,820,000. Benefits for each general recreation-day use are assumed equal to $2.10. Unit benefits for warm-water fishing and trout fishing are set at $2.10 and $2.50, respectively, per angler day. Using a 50-year life, 5% interest rates, the present value of the project's stream of benefits and costs--exclusive of concessionaire costs, are estimated to be $133,825,000 and $64,737,000, respectively, implying a benefit-cost ratio of 2.1 to 1.0. (Schroeder-Wisconsin)
W74-07128

NORTH COASTAL AREA ACTION PROGRAM. A STUDY OF THE MCKINLEYVILLE-TRINIDAD AREA: PUBLIC HEARING COMMENTS.
California State Dept. of Water Resources, Sacramento.
Bulletin No 105-2, December 1970. 28 p.

Descriptors: *Social participation, *Water supply, *Decision making, *Distribution systems, California, Costs, Fish management, Wildlife conservation, Recreation, Reservoirs, Investment, Diversion.
Identifiers: *McKinleyville-Trinidad(Calif), *Public hearings.

Comments at public hearings on the recommendations resulting from the initial investigation of possible water supplies for the McKinleyville-Trinidad area are summarized. Various California state agencies, and the U.S. Army Corps of Engineers generally concurred with the recommendations which suggested that the McKinleyville-Trinidad area be annexed to the Humboldt Bay Municipal Water District. At the same time these respective agencies suggested that the initial wildlife studies were limited, the need for interim water supply measures was over emphasized, trailer and campsite areas were being developed and would need water by 1973-74, and septic systems were a health hazard to some domestic wells, requiring tighter control of groundwater development and an improved public water supply. Humboldt County officials stressed the

need for the project, the responsibility of government to provide water, the need for more public involvement in the issue, a concern with present water related health hazards, and a concern with the project's cost. They also indicated that future water needs were underestimated in the initial report. Some technical questions were raised by private citizens, but a majority of this group endorsed the report's recommendations. The Davis-Grunsky Act, a state program providing financial assistance for local water projects, was also explained. (Slattery-Wisconsin)
W74-07129

SILVERWOOD LAKE RECREATION DEVELOPMENT PLAN.
California State Dept. of Water Resources, Sacramento.
Bulletin No 117-10, July 1970. 1 fig, 1 tab.

Descriptors: *Recreation facilities, *Reservoirs, Cost-benefit analysis, Camp sites, Multiple-purpose projects, Waste disposal, Boat-launching ramps, Fishing, Hunting, Tourism, Access routes, Aesthetics, Wildlife, California, Capital costs, Operating costs.
Identifiers: *Silverwood Lake(Calif.).

The recreational development plan for the proposed Silverwood Lake in the San Bernardino National Forest, California are described. The lake will have an area of about 1000 acres of water surface and will be one of the four major reservoirs of the State Water Project; it will provide for power generation, water regulation, recreation, and a fish and wildlife habitat. Out of 5300 acres to be acquired for the project 2400 will be developed for recreational use. Of that sum, 400 acres will be intensively developed for picnicking, camping, horseback riding, and the like. Hunting may also be permitted. The development plan includes wildlife enhancement, fishing, camping and picnicking sites, boat-in areas, hiking, and riding trails and a waste disposal system. The estimated $6,000,000 facilities are expected to generate average use of 2,250,000 recreation days annually. Based on a 50 year period at 5% interest, the present value of the stream of benefit from the sites is estimated at $94,423,000. The resulting benefit cost ratio is between 4.0-1.0. The proposed facilities were to be constructed to ensure that the recreational areas can be utilized by 1973. (Schroeder-Wisconsin)
W74-07130

LAND USE IN CALIFORNIA.
California State Dept. of Water Resources, Sacramento.
Bulletin No 176, December 1971. 16p, 26 maps.

Descriptors: *Surveys, *Land use, *Land classification, Land development, California, Mapping, Urbanization, Irrigation, Recreation, Water resources, Soil classification, Agriculture, Comprehensive planning.

The California Department of Water Resources recognized in the late 1940's the need for land use data in any water planning attempt and has consequently conducted two kinds of surveys. The first, land use, records the nature and extent of present water related land development. This survey is typically accomplished through aerial photography and field inspection. An index of land use surveys conducted during the 1950-1970 period is presented. Land classification surveys are also made to determine the location and extent of land with physical characteristics suitable for specific kinds of development. Such a survey involves field examination of soil characteristics and land features. The nature of land characteristics is such that data are useful in determining possible future growth of both irrigated agriculture and urban development. An index of land classification surveys is provided. (Schroeder-Wisconsin)
W74-07131

NORTH COASTAL AREA ACTION PROGRAM: A STUDY OF THE SMITH RIVER BASIN AND PLAIN.
California State Dept. of Water Resources, Sacramento.
Bulletin No 105-3, December 1970. 36p, 2 fig., 4 tab.

Descriptors: *Water resources development, *Water supply, *Planning, California, Future planning(Projected) River basin development, Wells, Groundwater, Water pollution, Land use, Water requirements, Agriculture, Lumbering, Urbanization, Coastal plains, Recreation.
Identifiers: *Smith River(Calif.), *Del Norte County(Calif.), Crescent City(Calif.).

Existing and future water problems and potential development in the Smith River Basin of northern California are discussed. Present regional water requirements are being met through groundwater pumping and direct diversion from the unregulated streamflow. Projected water demand by 2020 for agricultural and urban uses of 13,200 and 5,500 acre-feet can also be accommodated by potential increases uses of ground and surface water supplies. As a result, a proposed Rowdy Creek dam and reservoir for the region cannot be economically justified. The Bertsch Tract, 2-1/2 miles southeast of Crescent City and within the basin presently faces serious water problems which include low well yields and contamination; these problems can best be alleviated through an extension of the Crescent City water system. A threat is posed to water quality from septic systems of existing and proposed developments surrounding Lakes Earl and Talawa in the basin. Periodic testing should be required to check diminished water quality in the lakes and in water supplies. Recurrent flood damage should be alleviated by floodplain management instead of levees and reservoirs and balanced land use planning. (Schroeder-Wisconsin)
W74-07132

WATER RESOURCES SEMINAR SERIES NO. 2.
Hawaii Univ., Honolulu. Water Resources Research Center.
December 1972. 88p, 23 fig, 9 tab, 38 ref,

Descriptors: *Hawaii, *Water resources development, Water law, Hydrogeology, Land classification, Land use, Regional economics, Zoning, Tunneling, Water supply, Groundwater barriers, Economic efficiency, Drilling, Aquifer characteristics, Water transfer, Sugar cane, Water pollution effects, Water pollution control, Grading, Geology, Water wells.

The papers presented at this seminar examine current thought in water and land resource development and its applicability to Hawaii. 'The economics of water transfer' considers problems of pricing, equity, efficiency and regional development. 'The hydrogeology of carbonate and volcanic rocks' were investigated in connection with the probability of obtaining specified well yields at given investment levels. Increasing the water supply in Hawaii through angle drilling of groundwater barriers is also probed; this method has a 10:1 advantage over tunneling and conserves substantial amounts of water. Two papers discuss the economic and ecological impact of sugar mill wastes on the Hamuka Coast. Improved water management, soil recovery, and harvesting techniques are suggested as means to ameleorate the existing problem. The increased demand for scarce land is the subject of another paper. A statewide land survey is examined and its utility in solving urban and regional development problems considered. Changes in grading regulations are also examined; these regulations attempt to reduce the potential damages of landslides and now may reflect greater environmental and aesthetic considerations. The potential advantages of research approaches found by the Illinois State Water Survey are evaluated. (Schroeder-Wisconsin)
W74-07133

CURRENT THINKING IN WATER RESOURCES RESEARCH AND THEIR APPLICABILITY TO HAWAII CONDITIONS,
Illinois State Water Survey, Urbana.
W. C. Ackermann.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 55-56,

Descriptors: *Hawaii, *Water resources, Water policy, *Planning.
Identifiers: Oahu(Hawaii).

A paper presented at the seminar discussing the current evolution of thinking in water resources research is summarized. Planners in Hawaii face increasing demands on their limited resource base, rising problems resulting from waste siltation, insecticides, and the like, and rising public concern as a result of changing societal values. In particular, Hawaii's economy, which is highly dependent upon the groundwater system, faces challenges from a number of sources including seawater intrusion and contamination. In meeting this challenge, Hawaii has developed an integrated program of research, monitoring, planning and development, a partial result of aid provided under the 1964 Water Resources Research Act. In order to continue to meet this challenge, however, a greater level of integration between disciplines needs to be developed. The translation of environmental problems into forms which can be handled by engineers and decision makers represents one of the central tasks. (See also W74-07133) (Schroeder-Wisconsin)
W74-07135

RESEARCH ACTIVITIES OF THE ILLINOIS STATE WATER SURVEY,
Illinois State Water Survey, Urbana.
W. C. Ackermann.
In: Hawaii Univ., Honolulu, Water Resources Research Center, Water Resources Seminar Series No. 2, December 1972, p 59-60,

Descriptors: *Research and development, Meteorology, Water chemistry, Water quality, Waste treatment, Hydrology, Sampling, Sanitary Engineering, Administration, *Illinois.

A contribution to the seminar which examined current activities of the Illinois State Water Survey is summarized. The Survey, established in 1895 by the Trustees of the University of Illinois, had as its early objective the examination of potable water within Illinois. The Survey's responsibilities have continued to evolve, resulting in a variety of programs presently being conducted within each of its five sections. Within the Atmospheric Section, research is currently being conducted in areas which include the measurement of precipitation, cloud growth, and hail studies; and the effects of cloud seeding and urban-industrial activity upon weather conditions. The Chemistry Section has conducted extensive studies in water quality improvement, corrosion in pipe systems, encrustation, institutional management of water standards as well as analysis of water samples submitted by the public. The Hydrology Section is engaged in a number of studies covering stream flow and geomorphological studies, groundwater mapping, urban hydrological studies, and analytical model building to be used in ground water management studies. The Hydraulic Section's studies presently center on waste treatment problems. The major task currently before the Water Quality and Sanitary Engineering Section is the examination of water quality of the Illinois River. (See also W74-07133) (Schroeder-Wisconsin)
W74-07136

HAWAII'S STATEWIDE LAND CLASSIFICATION PROVES ADAPTABILITY AS LAND USE AND ENVIRONMENTAL CONCERNS CHANGE,
Hawaii State Land Study Bureau, Honolulu.
For primary bibliographic entry see Field 4A.

W74-07138

POSSIBLE IMPACT OF COSTS OF SELECTED POLLUTION CONTROL EQUIPMENT ON THE ELECTRIC UTILITY INDUSTRY AND CERTAIN POWER INTENSIVE CONSUMER INDUSTRIES. EXECUTIVE SUMMARY.
National Economic Research Associates, Inc., New York.
For primary bibliographic entry see Field 5G.
W74-07140

MULTI-DISCIPLINARY STUDY OF WATER QUALITY RELATIONSHIPS: A CASE STUDY OF YAQUINA BAY, OREGON,
Oregon State Univ., Corvallis. Dept. of Economics.
H. H. Stoovener, J. B. Stevens, H. F. Horton, A. Sokoloski, and L. P. Parrish.
Available from the National Technical Information Service as COM7210902 $3.00 in paper copy, $1.45 in microfiche. Oregon Agricultural Experiment Station, Corvallis, Special Report 348, February 1972. 135 p, 7 fig, 35 tab, 63 ref. WP-00107.

Descriptors: *Water quality, *Input-output analysis, *Decision making, *Fisheries, Regression analysis, Bays, Recreational demand, Salmon, Clams, Bottom fish, Demand, Direct benefits, Indirect benefits, Water pollution effects, Institutions, Institutional constraints, Oregon, Pacific Coast region, Bioassays, Pulp wastes, Sport fishing.
Identifiers: Yaquina Bay(Ore.).

Toledo, Oregon lies on the Yaquina Bay. While the town's income comes primarily from lumber, the Bay's economy relies on both manufacturing and tourism. Effluent from a kraft mill constructed in 1958 posed a threat to the Bay's tourist income. Estimated demand curves for bottomfish, salmon and clams yielded direct yearly benefits of over $22,000 to the Bay prior to the mill. Indirect benefits found using input-output tables accounted for over $317,000 a year. Bioassays were conducted to determine the effect of the effluent through its effect on angling success, angling success being an element determining recreational demand. Direct disposal of effluent into the ocean, into the Bay at Toledo, or into the Bay at McLean Point produced differing effects on demand through angling success. Disposal into the ocean, the actual method chosen by the mill, was found to produce the greatest direct and indirect benefits of the three alternatives. Examination of existing institutions and community decision processes is also necessary to determine which plan should and can be implemented. Existing laws may prevent implementation of some solutions and may not provide agencies with the capacity to implement others. Community concern with benefit distribution may also cause rejection of possible solutions. (See W74-07143 thru W74-07148) (Schroeder-Wisconsin)
W74-07142

THE DEMAND FOR SPORT FISHING AT YAQUINA BAY,
Oregon State Univ., Corvallis. Dept. of Economics.
J. B. Stevens.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon, Oregon Agricultural Experiment Station, Corvallis, Special Report 348, February 1972. p 5-12, 2 tab. WP-00107.

Descriptors: *Recreational demand, *Sport fishing, *Cost-benefit analysis, Salmon, Clams, Bottomfish, Direct benefits, Oregon, Pacific Coast region, Elasticity of demand, Methodology.
Identifiers: *Pollution control, *Demand function, Yaquina Bay(Ore.).

One of the inherent difficulties in choosing between alternative pollution control systems is in valuing the benefits and costs arising from each. Many of these effects are not valued in the market. A model to estimate the demand function for one of these effects, sports fishing, is illustrated for Yaquina Bay, Oregon. An exponential demand function is estimated for bottomfish, salmon and clams, with transfer costs of angling effort per angler day as a proxy for price, family income of the angler, and distance from angler's home to the fishery representing the independent variables in a multiple regression analysis. Data were collected through field and mail survey. The net economic value of sports fishing is found by maximizing the net rent which anglers would pay from the estimated demand function and is found to equal $15,366, $5,383, and $1,998 gross revenue from bottomfish, salmon and clams, respectively. Income elasticities of -0.24, +1.38, and -0.8 are also found. The discussion is concluded with a brief consideration of the criticism of the chosen methodology. (See also W74-07142) (Schroeder-Wisconsin)
W74-07143

THE IMPACT OF SPORT ANGLING ON THE YAQUINA BAY ECONOMY,
Oregon State Univ., Corvallis. Dept. of Economics.
H. H. Stoevener.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon, Oregon Agricultural Experiment Station, Corvallis, Special Report 348, February 1972. p 13-28, 7 tab. WP-00107.

Descriptors: *Indirect benefit, *Input-output analysis, *Sport fishing, Recreational demand, Pacific Coast region, Oregon.
Identifiers: Yaquina Bay(Ore.).

In addition to benefits received by recreationists from sport fishing, benefits arise from the expenditures which recreationists make in the local area. These benefits may be significant in local decision making, and a method should be devised to measure their effects. An input-output framework is used to illustrate the measurement of secondary benefits arising from sports fishing in Yaquina Bay, Oregon. Recreationists' expenditures for fishing were obtained through interviews and post-card surveys. These same surveys also allocated total expenditures by business sectors. The input-output framework defines the interrelationship of the business sectors and the effects on the local economy of the exogenous changes in demand. The overall effect upon the local economy of the exogenous demand of recreationists is estimated at $317,000 a year or nearly twice their $154,550 expenditures. Of this total, nearly $59,380 came to households. (See also W74-07142) (Schroeder-Wisconsin)
W74-07144

AN ECONOMIC EVALUATION OF ALTERNATIVE LEVELS OF WATER QUALITY: THE ROLE OF WATER QUALITY IN RELATION TO ECONOMIC BENEFITS,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
J. B. Stevens.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon, Oregon Agricultural Experiment Station, Special Report 348, February 1972. p 65-90, 2 fig, 7 tab. WP-00107.

Descriptors: *Estuarine fisheries, *Water pollution control, *Waste disposal, *Economic impact, Sport fishing, Pulp wastes, Alternate planning, Direct benefits, Indirect benefits, Comparative benefits.
Identifiers: *Yaquina Bay(Ore.).

An approach to estimate economic effects of different levels of water quality is related to fishing effort and fishing success, measures differences in income elasticities and is applied to types of fishing and kraft mill waste disposal alternatives for Yaquina Bay, Oregon. The quality variable was identified for sport angling and linked to the biological production function, making the possibility of determining the primary and secondary benefits of water pollution control apparent. The changes in angler effort due to water pollution, to changes in value of the fishery (primary benefits) and changes in incomes generated in the local economy (secondary benefits) are related empirically by a bio-economic model. The sport fishery was divided into three categories (bottomfish, salmon, and clams) and the biological effects on the fish population were estimated for each waste disposal alternative. Time series and cross-section estimation procedures and results were compared and long-run estimates chosen to estimate water pollution control benefits. The most appropriate estimates of success elasticities appear to be cross-section estimates of success elasticities for clam and bottomfish and long-run time series estimates for salmon fisheries. The largest benefit, $7,550 per year, would result from disposing pulp mill effluent in the ocean. (See also W74-07142) (Auen-Wisconsin)
W74-07146

WATER USES AND WATER DEVELOPMENT IN FALL CREEK--POSSIBLE CONFLICTS,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
L. S. Hamilton.
New York Water Resources and Marine Sciences Center, Ithaca, Publication No. 31, March 1970. 1 fig.

Descriptors: *Water utilization, *Planning, Streams, Water supply, Irrigation, Floods, Recreation, Social impact, Environment, Dams, *New York, *Water demand.
Identifiers: *Fall Creek(N.Y.), Cayuga Lake Basin(N.Y.).

Diversified water uses and projected development of Fall Creek, a 30-mile stream which flows into Cayuga Lake at Ithaca, New York are examined. The Fall Creek watershed consists of some 127 sq miles and is predominantly rural; about 40% is woodland, 35% in pasture, and 25% cropland and contains three small lakes. Fall Creek is utilized for a number of purposes. Cornell University consumes as much as 3.5 million gallons per day, its consumption increasing 5% yearly. The New York Electric and Gas Corporation and Ithaca Gun Company also utilize the stream water for cooling; it is also used for irrigation water. Surveys indicate, however, that expansion in irrigation acreage in the future will be limited. High water quality has made the creek particularly attractive for aesthetic, recreational, and scientific purposes. An examination of projected demands for water suggests that supplies may be inadequate. However, future management of the stream must explicitly consider impacts on this unique water resource of any attempts to meet future demand lest valuable and fragile elements be irreversibly destroyed. (Schroeder-Wisconsin)
W74-07149

UTILITY ANALYSIS IN THE VALUATION OF EXTRA-MARKET BENEFITS WITH PARTICULAR REFERENCE TO WATER-BASED RECREATION,
Oregon State Univ., Corvallis. Water Resources Research Inst. and Massachusetts Univ., Amherst. Water Resources Research Center.
J. A. Sinden.
Available from the National Technical Information Service as PB231701 $4.75 in paper copy, $1.45 in microfiche. WRRI-17, March 1973. 124p, 14 fig, 28 tab, 48 ref, 4 append. OWRR B-017-MASS (2).

Descriptors: *Recreation demand, *Value, *Analysis, *Benefits, Methodology, Psychological aspects, Evaluation, Regression analysis, Rivers, Reservoirs, Fishing, Camping, Boating, Aesthetics.
Identifiers: *Utility analysis, Taste preferences, Extra-market benefits, Scenic quality, Indifference mapping.

The travel-cost method used to value extra-market benefits implicitly assumes that all users have indentical tastes. An alternative approach is suggested which uses a photo-choice game to yield estimates of users' preferences in valuating these benefits. Data showing the utility of this approach is collected from 189 reservoir and adjacent resource users in the Cascade Mountains of Oregon and includes estimates of tastes and socioeconomic characteristics. Tastes were measured as the willingness of user to expend additional time or money using one of the choices in the photo-choice game to obtain cardinal estimates of preferences. Modified demand functions were estimated for ten activities with distance as a proxy for price, and tastes as the independent variables. Benefits under this method equal the area under the demand curve. Alternatively, it is suggested that benefits from each of these activities can be determined using indifference curve analysis. Utility maps were generated using the Ramsey method of utility estimation. Demand curves were generated from the indifference curve and benefits calculated. Finally, indifference curves are used to estimate option demand. Option demand curves can be used to value benefits which can arise from potential future activities. (Schroeder-Wisconsin)
W74-07150

PROBLEMS IN RECREATIONAL USE OF RESERVOIRS (PROBLEMY REKREATSIONNOGO ISPOL' ZOVANIYA VODOKHRANILISHCH),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
A. B. Avakyan, and V. B. Yakovleva.
Vodnyye Resursy, No 5, p 41-54, 1973. 2 tab, 29 ref.

Descriptors: *Reservoirs, *Reservoir operation, *Recreation, *Recreation demand, *Recreation facilities, Tourism, Economics, Costs, Foreign projects, Foreign research.
Identifiers: *USSR.

The value of recreation as an important component of reservoirs in the USSR is examined, and the reservoir-based recreation industry is compared with that of rivers and lakes. Present recreational use of reservoirs on the Middle and Lower Volga is analyzed, and foreign experience in the use of reservoirs for recreational activity is noted. Special attention is given to the recreational use of reservoirs for water supply. Reservoirs are classified on the basis of their potential recreational use, and scientific and practical problems in increasing recreation benefits of reservoirs are examined. To handle reservoir facilities for recreational use to satisfy the ever-growing demands of the working class, a special All-Union and Republic ministry must be established to coordinate finances, scientific investigations, and the design, construction, and operation of recreational facilities, and to introduce cost accounting to all facets of recreational services rendered to the public, excluding treatment at sanatoriums and health resorts. (Josefson-USGS)
W74-07193

A COMPUTER SIMULATION MODEL FOR FLOOD PLAIN DEVELOPMENT. PART II: MODEL DESCRIPTION AND APPLICATIONS,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6A.
W74-07296

SIMULATION--A TOOL FOR WATER RESOURCE MANAGEMENT,
Hydrocomp, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 6A.
W74-07300

ECONOMIC EVALUATION AND DETERMINATION OF PLANT CAPACITY AND DAM HEIGHT,
Public Power Corp., Athens (Greece).
For primary bibliographic entry see Field 8A.
W74-07305

COST SHARING FOR RECREATION: EFFICIENCY AND EQUITY,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
W. L. Miller, and B. A. Scherr.
Land Economics, Vol 50, No 1, p 58-65, February 1974. 1 tab, 10 ref.

Descriptors: Water resources development, Projects, *Cost sharing, *Economic efficiency, *Equity, *Linear programming, *Recreation, Optimization, Watersheds(Basins), Benefits, Costs, Distribution, Design, Methodology, Design, Systems analysis, Mathematical models, *Indiana.
Identifiers: *West Boggs Creek Watershed(Ind), Purpose scale, Facility mix, Income classes, Geographic location.

Improving cost-sharing procedures would enable society to better allocate its resources to achieve desired social goals. The impact is analyzed of changing the cost-share rules on the efficiency and equity of the recreational purpose of a water resource development project. The relation of efficiency and equity is examined by determining the impact of various cost-share rules on the selection of the economically optimum recreation purpose scale and facility mix. The impact of various cost-sharing policies is examined in terms of the distribution of recreation benefits and costs among different geographic locations and different income classes. In the methodology, each project plan involves at least two groups, the federal and the nonfederal. A socially optimum plan refers to the design which maximizes net national benefits. The model developed in this study is designed for application to the West Boggs Creek Watershed in southern Indiana. A general form of linear programming has been utilized to develop the optimum aggregate design for the recreation purpose in the watershed project. The model determines the efficiency of the project given varying endowments for the constraints; the equity aspects of the model are developed after the specification of the linear programming model. This analysis considers two situations: the nonfederal budget constant and federal budget constant. Results are presented and policy implications are discussed in detail. (Bell-Cornell)
W74-07307

WATER AND EFFLUENT TREATMENT PLANTS - COST CONSIDERATIONS AND CLIENT, CONTRACTOR, CONSULTANT RELATIONSHIPS, THE CONSULTANT'S VIEW,
For primary bibliographic entry see Field 5D.
W74-07312

DEVELOPMENT OF A DECISION ROOM FOR ENVIRONNTAL STUDIES, (FEASIBILITY STUDY),
Datametric C'OR H, McLean, Va.
For primary bibliographic entry see Field 6G.
W74-07371

PRODUCTION FUNCTION THEORY FOR USE IN OPTIMAL PLANNING DECISIONS,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 5D.
W74-07460

NEW CONCEPTS IN ENVIRONMENTAL PLANNING,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
D. A. Bella.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 13-17 (1972). 2 fig, 2 ref.

Descriptors: *Decision making, *Environment, Comprehensive planning, Projections.

The most significant element of the environmental predicament is the growing inability of man to predict the ecological results of any action taken and this gap appears destined to continue to grow. Traditional environmental decision making has refused to explicitly recognize this rising uncertainty, assuming instead that man's existing knowledge is adequate. This assumption may lead to resistance, reduction or elimination of those properties of ecological or social systems which are not explained within man's knowledge and which may be essential to the quality of life. A more appropriate environmental decision process would explicitly consider both man's knowledge and his ignorance. (See also W74-07491) (Schroeder-Wisconsin)
W74-07492

ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W74-07533

ENVIRONMENTAL PLANNING: AN ECONOMIC ANALYSIS. APPLICATIONS FOR THE COASTAL ZONE,
Clemson Univ., South Carolina. Dept. of Agricultural Economics and Rural Sociology.
J. C. Hite, and E. A. Laurent.
Praeger Publishers, Inc., New York, 1972. 155 p, 3 fig, 19 tab, 57 ref, append. OWRR B-012-SC(8).

Descriptors: *Methodology, *Input-output analysis, Economics, Environment, Planning, *South Carolina, Pollutants, Environmental effects, *Model studies.
Identifiers: *Coastal zones, *Charleston(S.C), Matrix, Environmental goods, Pecuniary income, Case study.

A conceptual framework for studying the linkages between the ecologic system and the socioeconomic system is developed and applied to analysis of the problems related to environmental planning in the coastal zone. This model contains two parts: an input-output matrix of the pecuniary sectors of the economy and an environmental matrix which shows the inputs (or outputs) of various natural resources (or pollutants) required to produce one dollar's worth of gross output by each sector in the input-output matrix. When the matrices are combined, empirical estimates of the direct and indirect linkages between the socioeconomic system and the environment are produced. This model is applied in a case study of the Charleston, South Carolina area. Applications of economic analysis to problems of evaluating planning alternatives for resource use in the coastal zone and types of institutions necessary to make use of such planning techniques are discussed. (Slattery-Wisconsin)
W74-07534

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMIC STUDY OF THE EFFECT OF MUNICIPAL SEWER SURCHARGES ON INDUSTRIAL WASTES AND WATER USAGE,
Clemson Univ., S.C. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W74-07057

POLLUTION, PRODUCTION, AND COMPENSATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5G.
W74-07064

PUBLIC INVESTMENT CRITERIA: APPLICATION TO A PROJECT IN THE SOURIS RIVER BASIN,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 6B.
W74-07070

UTILITIES AND FACILITIES FOR NEW RESIDENTIAL DEVELOPMENT: A SURVEY OF MUNICIPAL POLICY,
Urban Land Inst., Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-07071

HIGH-RATE MULTI-MEDIA FILTRATION,
Environmental Protection Agency, New York. Region II.
For primary bibliographic entry see Field 5D.
W74-07261

PHOSPHORUS REMOVAL TREATABILITY STUDIES AT C.F.B. BORDON, PETAWAWA, TRENTON AND UPLANDS,
Environmental Protection Service, Burlington (Ontario). Wastewater Technology Center.
For primary bibliographic entry see Field 5D.
W74-07273

ECONOMIC SIZE SELECTION FOR PVC PIPELINES,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8A.
W74-07303

OPTIMUM DESIGN HEIGHT OF COFFERDAMS,
Imperial Government of Iran, Tehran. Plan Organization.
For primary bibliographic entry see Field 8A.
W74-07304

COST SHARING FOR RECREATION: EFFICIENCY AND EQUITY,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-07307

CAPITAL COST MINIMIZATION OF DRAINAGE NETWORKS,
Duke Univ., Durham, N.C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W74-07309

USER CHARGES AND INDUSTRIAL COST RECOVERY, DENVER SMSA,
Wilbur Smith and Associates, Denver, Colo.
For primary bibliographic entry see Field 5D.
W74-07370

POSSIBILITIES OF EFFLUENT CLARIFICATION (MOEGLICHKEITEN DER ABWASSERKLAERUNG),
Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.
For primary bibliographic entry see Field 5D.
W74-07382

A REVIEW OF COLOUR REDUCTION TECHNOLOGY IN PULP AND PAPER MILL EFFLUENTS,
Beak (T. W.) Consultants Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5D.
W74-07406

ECONOMIC DAMAGES FROM RESIDENTIAL USE OF MINERALIZED WATER SUPPLY,
Environmental Protection Agency, Washington, D.C. Economic Analysis Div.
For primary bibliographic entry see Field 5C.
W74-07417

6D. Water Demand

COAL-ENERGY DEVELOPMENT IN THE NORTHERN GREAT PLAINS.
Wyoming Univ., Laramie. Water Resources Research Inst.
Available from the National Technical Information Service as PB-231 560, $4.75 in paper copy, $1.45 in microfiche. Completion Report, (October 1973). 131 p. OWRR B-024-WYO(1).

Descriptors: *Energy, *Great Plains, *Strip mines, *Demand, Coal mines, Lignite, Bituminous coal, Mining, Water resources development, Wyoming, North Dakota, Montana, Water demand, Research priorities, Projections, Decision making, Water quality management.
Identifiers: *Coal-energy development.

The growth demand for clean energy has focused attention on western coals, particularly the extensive lignite and sub-bituminous deposits in the Northern Great Plains. The Fort Union Powder River Coal beds, which underlie a large part of northeastern Wyoming, southeastern Montana and western North Dakota offer the greatest potential for development, because of the vast quantities of coal which can be strip mined. The U.S. Government has undertaken to assess coal/energy development problems through the Northern Great Plains Resources Program (NGPRP). The Water Resource Research Institutes of the three-state area, together with the Office of Water Resources Research, undertook the following tasks: (1) to determine the study needs, (2) to inventory current research efforts and to assess their potential contribution, (3) to establish the priorities for study as seen by the decision makers in the three states, and (4) to assess the capacity of the region's scientists to carry out the needed studies. Eight categories for study were identified: Trace elements; Atmospheric Effects; Surface Resources (including Reclamation); Coal Resources and Mining Techniques; Water (including Water Quality; Economic and Social Issues; Institutional and Legal Issues; and Technology Development.
W74-07056

PRELIMINARY WATER AND SEWER PLAN FOR ALCORN, BENTON, MARSHALL, PRENTISS, TIPPAH, TISHOMINGO COUNTIES.
Northeast Mississippi Planning and Development District, Booneville.
For primary bibliographic entry see Field 5D.
W74-07062

WATER AND WASTEWATER SYSTEMS INVENTORY - REGION H, NORTH CAROLINA,
Pee Dee Council of Governments, Troy, N.C.
For primary bibliographic entry see Field 5D.
W74-07063

WALLOWA LAKE BASIN COMPREHENSIVE PLAN.
Stevens, Thompson and Runyan, Inc., Portland, Oreg.
For primary bibliographic entry see Field 5D.
W74-07065

THE RELATIONSHIP OF LAND USE TO WATER USE IN SAN ANTONIO, TEXAS,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-07067

A FRAMEWORK FOR ECONOMIC PLANNING OF WATERSHED DRAINAGE,
Manitoba Univ., Winnepeg. Agassiz Centre for Water Studies.
For primary bibliographic entry see Field 4A.
W74-07069

MEASURES TO REDUCE WATER CONSUMPTION IN SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
November 1, 1973. 106 p, 4 fig, 21 tab, 14 ref, append.

Descriptors: *Water distribution, *Water conservation, *Water supply, *Management, *Water policy, Water resources, Water shortage, Water utilization, Municipal water, New York, Water, Domestic water, Economics, Dependable supply, Water users, Water costs, Water delivery, Conservation, Planning, City planning, Estimated costs, Regional development, Bodies of water, Hudson River, Leakage, Water loss.
Identifiers: *New York City, Water distribution systems, Water pricing.

Public water supply deficits in southeastern New York are estimated to be between 410 and 570 MGD in 2000 and between 710 and 1000 MGD in 2020. Measures to decrease expected needs, including universal metering, reduction of leakage from water distribution systems, increased water price to consumers to reduce demand, replacement of residential water-using appliances and fixtures by those using less water, and public education campaigns, are analyzed. Universal metering for New York City is recommended to allow detailed analysis of where high water use and possible leakage occur. Metering requirements must be included in building codes. Use of water-saving toilets, shower heads, and appliances is encouraged, promoted through metering, public education, and higher-priced water. Water pricing to influence consumption is recommended. Retail price for metered water in the City should remain at $.525 per 100 cubic feet until additional information is obtained to develop a sophisticated pricing schedule. An intense campaign of education similar to the one used during the drought of the 1960's is recommended only in the event of water shortages, yet a long-range public education campaign should stress water-saving methods and appliances, water pricing, and metering. (Grden-North Carolina)
W74-07079

PROPOSED WATER SUPPLY PROJECTS FOR SOUTHEASTERN NEW YORK.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
December 15, 1973. 300 p, 34 fig, 3 append, 17 tab.

Descriptors: *Water distribution, *Water supply, *Water demand, *Management, *Water policy, *New York, Water shortage, Water conservation, Water utilization, Municipal water, Domestic water, Economics, Water users, Water costs, Water delivery, Dependable supply, Estimated costs, Regional development, Hudson River, Bodies of water, Sources of supply, Supply, Water sources.

Local and regional water supply projects to overcome water deficiencies through 2020 in southeastern New York are discussed. Available water sources are inventoried to determine which can be developed for public water supply. Criteria to apply in project proposal development are presented to measure project value. Local projects recommended in previous water supply studies are reviewed to determine if they are feasible and offer the best alternatives for water supply use. If determined to be feasible, anticipated yields are subtracted from anticipated county and regional supply deficits. However, a large supply deficit still remains, which must be compensated for by regional projects. Eighteen regional projects are discussed and include data concerning supply capacity, construction stages, operating agencies, land requirements, and cost. All projects are combined into a regional plan to offer different possibilities for supplying regional deficits through 2020. Regional plans are first derived, assuming a middle level of population projection and universal metering, and the best alternative is selected. This plan is inspected to see how the combination and timing of projects would change if population projections and universal metering assumptions were modified. Additional projects to develop regional water supplies are then proposed. (Grden-North Carolina)
W74-07080

INSTITUTIONAL ARRANGEMENTS AND ALTERNATIVE FUTURES.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
December 15, 1973. 255 p, 7 fig, 51 tab.

Descriptors: *Institutions, *Water resources development, *Water supply, *Management, *Water policy, Water resources, *Regional development, New York, Water distribution, Water demand, Water conservation, Water utilization, Municipal water, Hudson River, Water, Water users, Water costs, Water delivery, Conservation, Dependable supply, Planning, Supply, Sources of supply, Resources, Bodies of water, Estimated costs, Domestic water, Economics.
Identifiers: Regional corporation, *New York City, Institutional arrangements.

Numerous institutions governing water supply in southeastern New York are the product of ad hoc responses to individual water needs and preclude a unified effort to meet regional needs. This regional approach is needed to encompass source as well as service areas and can function more efficiently and equitably. Twenty-four recommendations are presented for regional water supply development, including the following examples: A regional self-supporting corporation should be established by the legislature to plan, develop, construct, and operate water supply facilities and to take over New York City's existing upstate facilities. Counties and N.Y. City would be the sole purchasers from the regional supplier and would then re-sell to local authorities. Federal, interstate, and state roles should be restricted to research, data collection, planning, regulation, and financial assistance functions. Local governments should consolidate water supply and related services, as well as integrate water supply and waste water disposal services. Developers should construct water, sewage, and drainage systems at their own expense, but municipalities should assume ownership and operational control. Each county should establish a sewer and drainage agency to perform water-related services. (Grden-North Carolina)
W74-07081

WATER USES AND WATER DEVELOPMENT IN FALL CREEK--POSSIBLE CONFLICTS,
Cornell Univ., Ithaca, N.Y. Dept. of Conservation.
For primary bibliographic entry see Field 6B.
W74-07149

PROBLEMS IN RECREATIONAL USE OF RESERVOIRS (PROBLEMY REKREATSIONNOGO ISPOL' ZOVANIYA VODOKHRANILISHCH),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 6B.
W74-07193

IPSWICH RIVER BASIN MODEL STUDY,
Geological Survey, Boston, Mass.
A. W. Burns.
Journal of the New England Water Works Association, Vol 87, No 4, p 307-320, December 1973. 7 fig, 9 ref.

Descriptors: *Water supply development, *Long-term planning, *Simulation analysis, River basins, *Water demand, *Management, Operation and maintenance, Hydrology, Water quality, Computer models, Digital computers, Streamflow, Reservoirs, Alternative planning, Evaluation, Estimating, Optimum development plans, Systems analysis, *Massachusetts.
Identifiers: *Ipswich River basin(Mass).

In the Ipswich River basin, just North of metropolitan Boston, planners predict a significant increase in the demand for water resources. Long-range plans are needed for water supply development; in addition to satisfying water demands, ideal plans would include waste disposal, recreation, and esthetics. The progress of a cooperative study between the Commonwealth of Massachusetts, Division of Water Resources, and the U.S. Geological Survey is reported in which emphasis has been on the development of a hydrologic model for planning and management. Described in detail is the Ipswich operational digital computer simulation model being used to analyze alternatives for municipal water supply. The model simulates the hydrologic regime resulting from operation of present and proposed supply systems; considered are streamflow, operation of supply systems, and quality of river and reservoir water. Streamflow simulation is based on unregulated mean monthly streamflows at gaging stations within the basin. Simulation of supply systems operations consists of pumping wells, diverting water from river or reservoirs, and purchasing water from external sources. The model evaluates effects of alternatives on the basin's water quality. Presented are study results which describe the relative performance of certain proposals for supply systems under certain management conditions. Level of demand, hydrologic sequence, and legislated operating restrictions seem to have the greatest influences on model results. (Bell-Cornell)
W74-07302

THE GEOLOGY OF WATER: THE LIMITING FACTOR IN URBAN DEVELOPMENT,
Indiana Purdue Univ., Indianapolis. Dept. of Geology.
For primary bibliographic entry see Field 3D.
W74-07402

6E. Water Law and Institutions

A STUDY OF POTENTIAL INSTITUTIONAL ARRANGEMENTS FOR WATER QUALITY AND WATER RESOURCES (QUANTITY) PLANNING AND MANAGEMENT,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 6B.
W74-07051

INSTITUTIONAL ARRANGEMENTS AND ALTERNATIVE FUTURES.
New York State Temporary Commission on the Water Supply Needs of Southeastern New York, Albany.
For primary bibliographic entry see Field 6D.
W74-07081

SIERRA CLUB V. FROEHLKE (INJUNCTION ACTION AGAINST RESERVOIR PROJECT).
486 F 2d 946-954 (7th Cir 1973).

Descriptors: *Environmental effects, *Flood control dam, *Environmental control, Judicial decisions, Environmental engineering, Ecology, Public welfare, Water law, Rivers, Habitats, Social aspects, Vegetation effects, Population, Public safety, Legal aspects, Permits, Standards, Regulations, Water policy.
Identifiers: *Injunction, *Sierra Club, *National Environmental Policy Act, *Environmental impact statement.

The United States Court of Appeals examined the primary issue of whether an environmental impact statement prepared by the Corps of Engineers concerning a flood control dam project complied with the mandates of the NEPA of 1969. A secondary issue considered was whether the failure of the Corps of Engineers to request and obtain local assurances of participation from two downstream communities voided the project. In 1962 Congress authorized the construction of a flood control dam on the Kickapoo River. Also involved were supplemental flood protection levees at two small downsteam communities. The Corps prepared a final environmental impact statement and forwarded to the Council on Environmental Quality. Plaintiffs argue that the Corps failed to include all possible detrimental effects and failed to give proper consideration to alternatives. Also argued was the failure of the district court to utilize the correct test to determine the sufficiency of the statement. The Corps argues that the environmental impact statement meets the requirements of NEPA. The court in affirming the lower court's decision for the defendants stated that the court was aware of several standards of review in assessing the adequacy of the environmental impact statement and that the decision was reached after a full, good faith consideration and balancing of environmental factors. (Proctor-Florida)
W74-07113

SCENIC RIVERS.
Pa. Stat. Ann., secs 821.1 thru 21.8 (1972).

Descriptors: *Pennsylvania, *Recreation, *Aesthetic, *Rivers, *Public lands, *Scenic easements, Engineering structures, Legislation, State governments, Adoption of practices, Coordination, Regulation, Conservation, Environmental sanitation, Land management, Water resources development, Parks, Watershed management, Federal government, Zoning, Natural resources, Wild rivers, Impounded waters, Watershed protection, Legal aspects, Economic aspects, Eminent domain.

This statute provides for the creation of a Pennsylvania scenic rivers system to preserve the aesthetic and recreational qualities of unspoiled streams. The system will be comprised of wild river areas, which are rivers that are free of impoundments and generally inaccessible except by trail, with primitive watersheds and shorelines and unpolluted waters. Also included are scenic rivers and recreational rivers. Scenic rivers are those

free of impoundments with undeveloped watersheds and shorelines, but accessible in places by roads. Recreational rivers are those rivers which are readily accessible, that may have some development along their shorelines, and that may have undergone some impoundment in the past. The Department of Environmental Resources is authorized to study and conduct public hearings to submit proposals for the designation of rivers as part of the scenic rivers system. The proposal will specify the category of the proposed river. A public hearing will be held in the county where the land is located concerning the proposed use. The department can acquire scenic easements within the boundaries of the river system by eminent domain or by other methods. The inclusion of rivers in a state river system is not meant to preclude the river from becoming part of a national scenic rivers system. (Sperling-Florida)
W74-07114

SEDIMENT CONTROL.
Ann. Cd of Md, art 96A, secs 105, 106 (Supp 1973).

Descriptors: *Maryland, *Project planning, *Adoption of practices, *Permits, *Soil erosion, *Sediment control, Legislation, Administrative agencies, State governments, Coordination, Watershed protection, Watershed management, Impaired water quality, Aquatic life, Recreation, Social aspects, Regulation, Specifications, Water resources development, Construction.

As a result of erosion and sediment deposition in waters within the watersheds of Maryland, such waters are being polluted and despoiled to such a degree that fish and the recreational use of the waters are being adversely affected. The Secretary of National Resources is to adopt criteria for the implementation of soil and shore erosion control programs. Before land is cleared, graded, transported, or otherwise disturbed, the proposed alteration is to be submitted for approval. Regulations for erosion and siltation control requirements for utility construction are to be adopted by the Washington Suburban Sanitary Commission. These regulations shall apply to all contractors doing work for the Commission. No utility construction will be undertaken until an erosion and sediment control plan has been submitted and approved. Upon review and approval by the county, the Commission can then issue a permit for construction. The county will inspect and enforce the conditions of the approved plans and permits. The Department of Natural Resources will assist the soil conservation districts in the preparation of a unified sediment control program. The Department will also review and approve all land clearing, soil movement, and construction undertaken by any agency of the state government. (Sperling-Florida)
W74-07115

NATURAL RESOURCES--WASTE CONTROL.
Ann Cd of Md, art 66C secs 411V-411AD, (1973).

Descriptors: *Maryland, *Specifications, *Waste water treatment, *Waste water disposal, *Sewage effluents, State governments, Legislation, Administration, Adoption of practices, Administrative agencies, Waste water(Pollution), Water pollution sources, Watershed protection, Environmental sanitation, Rivers, Engineering structures, Advanced waste treatment.
Identifiers: *Administrative regulations.

As a result of poorly treated effluent discharged from sewage disposal plants and from erosion and silt from construction on lands within the Patuxent River watershed, the river is being seriously polluted. The despoilation is severe enough that fish, marine life and recreational use of the river is being adversely affected and curtailed. All persons disposing of or treating sewage within the watershed shall anticipate the need for advanced waste treatment, and all future plants shall be constructed accordingly. The owners and operators of any existing plants that do not meet the standards will submit a plan for improved sewage disposal. The plan will indicate the necessary improvements required to insure purity of the effluent and a time schedule for the construction of those improvements within five years. If a plan is not submitted or it is submitted but construction does not take place, the county will proceed with the plan and the work. Owners of the plant will be liable for expenditures so made including attorney's fees. The county health department will take at least one monthly stream sample at the critical point of all sewage disposal plant overflows within the watershed. The discharge of raw sewage or waste into the river is a misdemeanor. Oyster and clam shells and other materials used in the culture of marine life are not considered waste. (Sperling-Florida)
W74-07116

ANSLEY V. TARRANT COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT NO. ONE (LIABILITY FOR FLOODING AND AMOUNT OF DAMAGE).
498 S.W 2d 469-477 (Texas 1973).

Descriptors: *Texas, *Flood damage, *Flood recurrence interval, *Dam construction, Erosion, River flow, Construction, Spillways, Dams, Legal aspects, Judicial decisions, Water law, Floods, Flooding, Flood plains, Floodwater, Reservoirs, Reservoir construction, Damages, Water, Water control.

Appellant appealed decision in favor of appellee, water control district, to recover permanent damages to land alleged to have been caused by repeated flooding by a dam and spillway constructed by appellee. The appellee denied generally the allegations of the petition and specifically alleged that the land in question had been historically subject to floods prior to the construction of the dam and spillway and that they actually caused no damage to the lands because the land had always been and would be subject to flooding by the nearby river. In the alternative appellee alleged on temporary and sporadic damage and not a permanent one. The court held there was basic error in the assumption that property which had been floodlands from time to time suffers a decrease in value automatically as a matter of law, if the appellee's conduct contributed to additional flooding. The inquiry should be whether the property has, in fact, suffered a decrease in value by reason of the alleged unlawful interference. The jury is bound to decide the issue and opinion testimony does not establish any material fact as a matter of law. The court thinks the jury is authorized to consider before and after value and justified in leaving the parties where they found them. (Daniels-Florida)
W74-07117

METALLIC MINERAL MINING OPERATIONS, (ACQUISITION OF SURFACE LANDS FOR WATER QUALITY CONTROL).
Mich Comp Laws Ann, sec 425.181 (Supp 1973).

Descriptors: *Mining, *Environmental effects, *Michigan, *Legislation, Natural resources, Land use, Mine wastes, Minerals.

This act provides for the reclamation of lands subjected to the mining of minerals and seeks to control possible adverse environmental effects of mining. Its aim is to preserve the natural resources and to encourage the planning of future land use. The act further provides for the promotion of the orderly development of mining, encouragement of good mining practices, and the recognition and identification of the beneficial aspects of mining. (Daniels-Florida)
W74-07119

THE INTERLAKE AFFAIR,
Businessmen for the Public Interest, Washington, D.C.
For primary bibliographic entry see Field 5G.
W74-07120

POLLUTION SANCTIONS--NEW ALTERNATIVES TO CIVIL LIABILITY,
Food and Agriculture Organization of the United Nations, Rome (Italy). Environment Law.
For primary bibliographic entry see Field 5G.
W74-07123

INSTITUTIONAL CONSIDERATIONS,
Oregon State Univ., Corvallis. Dept. of Agricultural Economics.
A. Sokoloski.
In: Multi-disciplinary Study of Water Quality Relationships. A Case Study of Yaquina Bay, Oregon Agricultural Experiment Station, Special Report 348, February 1972. p 91-104, 2 tab. WP-00107.

Descriptors: *Institutional constraints, *Alternate planning, *Waste disposal, Riparian rights, Local governments, Legal aspects, Recreation, Welfare(Economics), Sport fishing, Estuarine fisheries.
Identifiers: *Yaquina Bay(Ore.).

The institutional context in which economic decisions are made may aid or impede the implementation of efficient choices. The potential impacts of existing institutions on the economic consequences of varying water quality standards in Yaquina Bay, Oregon is examined to illustrate this point. Included in the institutions considered were water rights and pollution laws. The legal limits and performance limitations of counties, special districts, and the state are also discussed. The most formidable barrier limiting the ability of existing institutions to alter disposal choices were found to be pollution laws which prohibit any degree of effluent dilution and the absence of any existing local management units which might facilitate whatever adjustments are possible. Four other issues are discussed: the criterion to evaluate governmental entities, the measurement of benefit and cost flows across governmental units, the relationship of these flows to compensation theory in welfare economics, and potential integration of functions best performed by alternative governmental units to aid in the implementation of economic choices. (See also W74-07142) (Schroeder-Wisconsin)
W74-07147

STORMFLOW POLLUTION CONTROL IN THE U.S.,
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5D.
W74-07256

STREAM POLLUTION.
Tenn. Code Ann., secs. 70-324 through 70-342 (1971).

Descriptors: *Tennessee, *Water law, *Legislation, *Water quality, *Pollution, Water resources, Water resource planning, Water quality control, Pollution control, Pollution abatement, Waste disposal, Waste treatment, Waste water control, Waste water treatment, Waste discharge, Recreation, Water resources development.

The Water Quality Control Act of 1971 declares the interest of the public and the state of Tennessee in having unpolluted waters. This Act recognizes the obligation of the state to secure, protect and preserve this right and its purpose includes the abatement of existing pollution, the reclamation of polluted waters, the prevention of future pollution as well as a plan for the future use of the state's water resources so that they may be used and en-

joyed to the fullest extent consistent with the maintenance of unpolluted waters. The Act establishes the Tennessee water quality control board to adopt standards for all waters of the state, considering the size, depth, surface area covered, volume, direction, rate of flow, stream gradient and water temperature, as well as the character of the surrounding land. The board shall also consider all physical, chemical, biological, bacteriological or radiological properties that may be necessary for preserving the quality and purity of the waters. Alteration of water properties, construction or operation of treatment works, waste discharge facilities or waste discharge outlets shall henceforth require special permit issued by the board. (Silber-Florida)
W74-07275

SANITARY DISTRICTS FOR SEWAGE DISPOSAL.
W. Va. Code Ann., secs. 16-12-1 through 16-12-14 (1967).

Descriptors: *Sewage districts, *West Virginia, *Legislation, *Waste treatment, *Environmental sanitation, *Water quality control, Public health, Sewage treatment, Waste disposal, Waste water, Waste water treatment, Administrative agencies, Structures, Municipal wastes, Discharge, Drainage, Water pollution treatment, Pollution control, Pollution abatement.

One or more incorporated cities, towns and/or villages located in an area of contiguous territory are authorized to incorporate into one sanitary district for purposes of comfort, convenience or the preservation of the public health. The district may construct and maintain a plant or plants for the purification and treatment of sewage, and maintain one or more outlets for the drainage thereof. Each district may employ the necessary personnel needed to carry out its functions. The districts may provide for sewage disposal and drainage and provide for the savings and preservation of the water supplied to the districts from contamination, by contructing and maintaining sewage treatment plants, sewers, channels, drains or outlets. Nothing contained within the statute shall authorize the district to operate a system of waterworks for the purpose of furnishing or delivering water to any such municipality or its inhabitants. A district may acquire property necessary to carry out its functions. (Silber-Florida)
W74-07276

WEST VIRGINIA WATER DEVELOPMENT AUTHORITY.
W. Va. Code Ann., sec 20-5C-1 thru 20-5C-23 (1972).

Descriptors: *West Virginia, *Water law, *Legislation, *Water resources, *Water development, Water, Water purification, Water quality, Water quality control, Water policy, Project policy, Streams, Water pollution, Pollution control, Pollution abatement, Sewage, Sewage disposal, Water structures, Environmental engineering, Public health, Environment.

It is the responsibility of the state of West Virginia to establish, fund, operate and maintain water development projects, to maintain, preserve, protect, conserve, and in all instances possible to improve the purity and quality of water within the state. Other objectives include protecting and improving public health, assuring the fullest use and enjoyment of such water by the public and providing suitable environment for the propagation and protection of animal, bird, fish, aquatic and plant life. The state shall also provide water of the necessary quality and in the amount needed for the development, maintenance and expansion of all types of industries and businesses. The West Virginia Water Development Board is directed to assist in the preservation, protection, improvement and management of the purity and quality of the waters, prevent or abate pollution of water resources, promote the health and welfare of the state's citizens, improve stream quality, and remove harmful liquid and solid wastes from the waters. (Silber-Florida)
W74-07277

RIVER REGULATION--RESERVOIRS.
N.Y. Environmental Conservation Law, sections 15-2101 thru 15-2141, p 585-628 (1972).

Descriptors: *New York, *Legislation, *Rivers, *Water management, *Water development, Reservoirs, Dams, Floods, Flood control, Administrative agencies, State governments, Water resources, Water resources development, Water utilization, Power plants, Protection, Flood protection, Regulation, Drainage, Navigable waters, River flow, Water law, Planning, Cooperation, Coordination.

The establishment and operation of river development districts in New York are authorized. Each district is responsible for formulating and carrying out plans which regulate and maintain the orderly flow of rivers within their boundaries. Each district is also charged with determining the need for and feasibility of reservoirs and reservoir construction. Included within the scope of this duty is the power to discontinue or relocate highways, roads and streets. The districts are also authorized to grant access to their respective rivers for the purpose of developing sources and sites of potential water power resources. In addition, the districts shall have eminent domain powers to acquire lands and facilities necessary to fulfill their mandate, consistent with the best public interest. Moreover, each district may contract to dispose of the natural resources present upon any of their real property in any manner they deem appropriate, as long as it is consistent with the purposes of this statute and the public good. (Silber-Florida)
W74-07278

WILD, SCENIC RIVER SYSTEMS.
N.Y. Environmental Conservation Law, secs. 429v, p. 445-450 (1972).

Descriptors: *Water conservation, *Aquatic environment, *Water policy, *Rivers systems, *Water resources, *New York, Legislation, Administration, Inter-agency cooperation, Federal government, Water supply, Water quality, River flow, Boundaries(Property), Water resources development.

The establishment of a wild, scenic and recreational rivers system is described. Selected rivers shall be preserved in a free-flowing condition, so they and their immediate environs will be protected for the benefit and enjoyment of the people. The statute institutes a state river system, designating its initial components and prescribes methods and standards by which additional rivers may be added to the system. The commissioner of environmental conservation shall have exclusive jurisdiction over all river areas, other than those within the Adirondack Park, which shall be under control of the park agency. The rivers shall be classed either as wild, scenic or recreational rivers and the criteria for inclusion into one of those three categories are set forth, as well as the management objectives. After inclusion into the system, no structure impeding the natural flow shall be constructed. Land uses, within the exterior boundaries of the designated river areas are set forth and such boundaries shall be established by the commissioner. Cooperation is urged with the federal government and with other agencies. In case of a conflict with other laws, the more restrictive provision shall apply. (Sutton-Florida)
W74-07280

CLASSIFICATION OF WATER AND WATER STANDARDS.
N.Y. Environmental Conservation Law, secs. 17-0301 through 17-0303, p 656-668 (1972).

Descriptors: *Water pollution, *Water policy, *Water pollution control, *Water quality, Water supply, Legislation, *New York, Water conservation, Administration, Water quality control, Interagency cooperation, Water pollution sources, Waste water(Pollution), Water demand, Water quality standards.

Water pollution control, the classification of state waters and the promulgation of water standards are described. The (Department of Health), after investigation and public hearings, shall group designated state waters into classes. The classifications will be in accordance with the best usage in the public interest. Once classified, standards of water quality and purity will be assigned to each class, taking several criteria into consideration. Sources of water supply will be further classified according to the maximum amount of monthly median coliform allowed in each source, determined by a sampling technique. Further proceedings on the Commissioner's part are provided in case of violations and he may adopt and assign more restrictive standards for the best usage of the states waters. Regulations are set forth concerning the public hearings and notice therof. The general powers and duties applicable to the statute are detailed, with the department having administrative jurisdication to abate and prevent water pollution in the state's waters. The Commissioner's authority will include holding public hearings, requiring the discontinuance of sewage discharge, bringing suit to compel performances, issuing permits under proscribed conditions, as well as other powers. The duties and responsibilities of the department are then defined, including the right of inspection, at reasonable times, of operations and records. (Sutton-Florida)
W74-07281

LAW AFFECTING THE QUALITY OF THE MARINE ENVIRONMENT,
For primary bibliographic entry see Field 5G.
W74-07282

RIPARIAN RIGHTS IN CERTAIN COUNTIES.
Md. Code Ann., art. 66C, sec 253 (Supp. 1973).

Descriptors: *Maryland, *Legislation, *Water law, *Water utilization, *Water rights, *Riparian rights, Water resources development, Riparian law, Fisheries, Competing uses, Legal aspects, Ownership of beds, Prescriptive rights.

The owner, tenant, or lessee of any land bordering on any tidal waters of the tributaries of the Chesapeake Bay, except the waters of the Great Choptank River, lying in the state of Maryland is entitled to make a choice of the set or position to place nets or establish a haul seine fishery in front of such property. If such owners of the riparian rights do not avail themselves of this privilege within twenty days after receiving notice from any other person who may desire to locate their nets or fishery in front of said person's property, then it shall be lawful for such persons to locate their nets. Permission of the owners shall always be necessary for the waters of Baltimore, Talbot, Caroline, Dorchester, Prince George's, St. Mary's and Charles counties. Fishing shall not be permitted in any waters within 500 yards of any shore used as a pleasure resort, or to interfere with bathing or boating without the owner's permission. Persons quilty of violating these provisions shall be subject to fine and forfeiture of their fishing equipment. (Silber-Florida)
W74-07283

A BILL TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO ENGAGE IN FEASIBILITY INVESTIGATIONS OF CERTAIN POTENTIAL WATER RESOURCE DEVELOPMENTS.
Senate Bill 3959, 92d Cong, 2d Sess September 1972 2 p.

Descriptors: *Water resource development, *Legislation, *Potential water supply, *Federal government, *Feasibility studies, Ground water resources, Water supply, Oklahoma, North Dakota.

This Senate bill authorizes the Secretary of the Interior to engage in feasibility investigations of certain potential water resource developments in southwestern Oklahoma and in central North Dakota. The bill was referred to the Committee on Interior and Insular Affairs. (Daniels-Florida)
W74-07284

FISHERIES AND GAME; GENERAL PROVISIONS.
Conn. Gen. Stat. Ann. secs. 26-3, 26-6, 26-8, 26-17a (Supp. 1972).

Descriptors: *Connecticut, *Wetlands, *Wildlife conservation, *Aquatic environment, Aquatic habitats, Inland waterways, Fish conservation, Fisheries, Game birds, Land classification, Spawning, Conservation, Legislation, Wildlife, Fish, Wildlife habitats, Environmental control.
Identifiers: Retaining ponds.

The Connecticut Commissioner of environmental protection shall enforce all laws relating to fish, birds and wildlife. He shall supervise hatcheries and retaining ponds and may designate any area of inland water as closed to fishing, in order to provide spawning beds. Acquisition may be made by gift, lease or purchase of lands for the establishment of fish hatcheries or game preserves. The commissioner may allocate the funds acquired for the purpose of preserving and propagating fish, birds and wildlife. Conservation officers and patrolmen will enforce the regulations issued by the commissioner, and may arrest any person found to be in violation of these provisions. An officer may, without a search warrent, examine various items of personal property if he believes that any animal is being kept within, in violation of the statutory provisions. Dwelling places may be likewise searched upon obtaining a search warrant. The commissioner is empowered to acquire title to or make agreements with the owners of any tidal wetlands area in order to limit the future use or otherwise conserve such tidal wetlands. (Ritchie-Florida)
W74-07286

UNITED STATES V. POT-NETS, INC. (VIOLATION OF RIVERS AND HARBORS ACT),
363 F. Supp. 812-817 (D.C. Delaware 1973). 6 p.

Descriptors: *Navigable waters, *Rivers and Harbors Act, *Tidal effects, *Channels, *Judicial decisions, Waterways, *Delaware, Tidal marshes, Lagoons, Bodies of water, Water levels, Water law, Dredging, Federal government, Legal aspects.
Identifiers: *Injunction.

The United States brought action against developers of projects which had been built in part on highlands and on abutting marshland for violation of the Rivers and Harbors Act. The government sought injunctive relief to bar further dredging, filling and bulkheading work and a mandatory order requiring the defendants at their expense to restore the marshes to their previous natural state. The plaintiff contended that all the waterways adjacent to defendant's projects were navigable in fact, and the adjacent marshes on which the projects were partially built were inundated by ordinary high tides of those navigable waters and are therefore also navigable waters of the United States. The defendants contended that the marshes were not navigable waters and that the natural or man-made canals or lagoons which do not lead to any public landing or place but merely dead-in into private property are either private or state waters and not navigable waters. The United States District Court concluded that the criterion for determining navigability is capability for commercial traffic rather than manner and extent of use. The court denied the motions for summary judgment concluding that material issues supported by affadavits and aerial photographs remained in dispute. (Proctor-Florida)
W74-07287

BURLEIGH V. CALLOWAY (INJUNCTION AGAINST A BEACH EROSION PROJECT).
362 F. Supp. 121-124 (D. Hawaii 1973). 4 p.

Descriptors: *Hawaii, *Beaches, *Beach erosion project, *Access routes(Recreation), *Cost-benefit analysis, *Environmental effects, Federal government, State governments, Administration, Economics, Recreational facilities, Tourism, Recreation demand, Judicial decisions, Project planning, Estimated costs, Estimated benefits.
Identifiers: *Environmental Impact Statements, *National Environmental Policy Act, Injunction.

The plaintiffs, citizens and community groups, sought under the National Environmental Policy Act (NEPA) to enjoin all acts on the part of the defendant, the Secretary of the Army, in furtherance of the Waikiki Beach erosion control project which threatened to demolish the Hawaii war memorial known as the Natatorium. The erosion control project was state and federally funded and is directed by the Army Corps of Engineers. Its purpose was to improve the beach by increasing beach land, improving access to the shoreland and preventing future beach sand erosion. The planned improvements in this segment of the project consisted of the construction of three new groins, placement of approximately 46,00 cubic yards of sand, and demolition of the Natatorium. The plaintiffs urge that the environmental impact statement and its supplement are insufficient to comply with NEPA. The court declared that the plaintiffs' motion for preliminary injunction must be dismissed as it appeared that (1) no viable alternatives to the Natatorium's destruction existed, (2) the restoration and incorporation of the Natatorium into the project was not feasible, and (3) no expert testimony showed a withholding of information of possible environmental impact as a result of the project. (Proctor-Florida)
W74-07288

PROTECTION OF THE ENVIRONMENT.
Federal Register, Vol 38, No 159, p 22298-11199 (1973).

Descriptors: *Legislation, *Regulations, *Permits, *Pollutants, *Discharge, Administrative agencies, Control, Wastes, Waste treatment, Effluents, Coliforms, Suspended solids, Sewers, Treatment facilities, Industrial wastes, Industrial pollution, Water quality, Water quality control, Legal aspects, Water law, Water policy, Pollution control, Pollution abatement, Impaired water quality, Water pollution sources.

The Environmental Protection Agency (EPA) has reorganized and clarified its regulations concerning secondary treatment within the scope of the Federal Water Pollution Control Act Amendments of 1972. Some of the major changes include: clarifying that in no case should the percentage removal of biochemical oxygen and suspended solids be less than eighty-five percent in any thirty day period, and a relaxing of certain of the above standards shall only be allowed for treatment works receiving flows from combined sewer systems during wet weather. The sections of the Act affected by the announced changes include those dealing with minimum level of effluents, biochemical oxygen demand, suspended solids, fecal coliform bacteria, combined sewers, secondary treatment works, industrial wastes, industrial pollution, sampling and test procedures. (Silber-Florida)
W74-07289

WILD AND SCENIC RIVERS.
Minn. Stat. Ann., secs. 104.31 to 104.40 (Supp. 1973), amended, ch. 271, secs. 1-10 (1973) Laws of Minn.

Descriptors: *River beds, *Management, *Water conservation, *Rivers, *Administration, Legislation, *Minnesota, Project planning, State governments, Inter-agency cooperation, Water resources development, Erosion control, Scenery, Land resources, Wildlife.
Identifiers: *Land acquisition.

This Minnesota statute relates to natural resources and the preservation and management of rivers. In the context of the Act, 'river' means a flowing body of water such as a stream or a segment or tributary thereof, including lakes through which the river or stream flows. A system of classification is established with three categories, wild, scenic or recreational rivers. The administration of the system is under the commissioner of natural resources and he shall promulgate statewide minimum standards and criteria for the preservation and protection of shorelands within the boundaries of the system. The Commission shall prepare a management plan, make it available to those affected and shall conduct public hearings. Local land use ordinances will be promulgated after the districts and management plans are made public. To futher the Act's purpose, acquisition of lands is provided for by all lawful means. Responsibilities of other governmental units, federal-state relations, and those situations where conflict with other laws arise are also dealt with. (Sutton-Florida)
W74-07290

UNITED STATES V. IRA S. BUSHEY AND SONS, INC. (INJUNCTION AGAINST OIL SPILLS).
363 F. Supp. 110-123 (D. Vermont 1973) 14 p.

Descriptors: *Vermont, *Oil spills, *Oil pollution, *Rivers and Harbors Act, *Water pollution sources, Oil, Water law, Common law, Water pollution, Regulation, Negligence, Judicial decisions, Coast Guard regulations, Legislation, Legal aspects, Federal Water Pollution Control Act.
Identifiers: *Nuisance(Legal aspects), Injunction.

Plaintiff-United States sued the corporate owners of vessels engaged in transporting oil on Lake Champlain, for injunctive relief with respect to oil spills. From April, 1967 to December, 1972 vessels of defendant corporation's subsidiaries were involved in nine oil spills. The court determined that the oil spills had occurred as a result of slack operations, including drinking on duty by crewmen, use of faulty equipment, and the employment of unlicensed operators. Such operation was said to be a continuing nuisance threatening the general public, wildlife, lakefront property owners and water quality of Lake Champlain. Defendant contended that the corporate veil shielded the parent firm from the torts of subsidiaries, that equitable relief was precluded by the Federal Water Pollution Prevention and Control Act of 1972, and that the Coast Guard's authority under the Navigation Rules precluded court action in the form of injunctive relief. The court held that equitable relief could be granted based on the Rivers and Harbors Act of 1899, and the federal common law of nuisance. The court issued a mandatory injunction to require compliance with a list of safety procedures adopted by the court. (Perrey-Florida)
W74-07291

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM.
Federal Register, Vol 38, No 141, p 19894-19896 (1973).

Descriptors: *Legislation, *Regulations, *Permits, *Discharge, *Pollutants, State governments, Water policy, Administrative agencies, Control, Waste discharge, Sewage discharge, Effluents, Sewage treatment, Waste treatment, Municipalities, Industrial pollutants, Industrial wastes, Water quality control, Standards, Water pollution, Water pollution sources, Pollution abatement, Pollution control, Impaired water quality, Water policy, Legal aspects, Water law.

The Environmental Agency (EPA) pursuant to authority granted in the Federal Water Pollution Control Act Amendments of 1972 and the National Pollution Discharge Elimination System section contained within shall issue permits for the discharge of any pollutant or combination of pollutants, upon condition that such discharge will meet all applicable requirements of the Act relating to effluent limitations, water quality standards and implementation plans. New source performance standards, toxic and pretreatment effluent standards, inspection, monitoring, entry provisions and guidelines establishing ocean discharge criteria must also be met when applicable. States desiring to administer their own program must submit a full and complete program description to the EPA for approval. The state programs can not be approved unless they conform to the EPA guidelines. Certain standards regarding municipal treatment plants, capacities, industrial and manufacturing plant discharges, and various procedural requirements have been adjusted in accordance with various comments and suggestions that have been submitted. (Silber-Florida)
W74-07293

ENVIRONMENTAL IMPACT ANALYSIS: AN EXAMINATION OF THREE METHODOLOGIES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W74-07339

MORE HEAT THAN LIGHT: THERMAL POLLUTION VERSUS HEAT ENERGY UTILIZATION,
Snessard L. Holland Law Center, Gainesville, Fla.
For primary bibliographic entry see Field 5B.
W74-07465

LAWS AND REGULATIONS OF POLLUTION AND NAVIGATION IN PACIFIC NORTHWEST ESTUARIES,
Coast Guard, Portland, Oreg.
For primary bibliographic entry see Field 5G.
W74-07499

PACIFIC NORTHWEST COASTAL ZONE MANAGEMENT AS IT RELATES TO ESTUARY PROTECTION,
Oregon Coastal Conservation and Development Commission, Port Siuslaw.
W. B. Ternyik.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 109-111 (1972).

Descriptors: *Oregon, *Legislation, *Estuaries, *Protection, Coordination, Jurisdiction, Political constraints, Federal government, Comprehensive planning, State governments, Local governments, Permits.
Identifiers: *Coastal zone.

There were some 208 governmental bodies (federal, state, and local) that have traditional and/or legal interests in the Oregon coastal zone management. A substantial portion of the coastal zone management problem arose out of interagency conflicts over jurisdiction in addition to a maze of duplicating mandates. The Oregon Coastal Conservation and Development Commission, consisting of 24 elected coastal zone officials plus six governor's appointees, representing statewide interests was authorized by the legislature. The commission's mandate is to prepare a coordinated comprehensive natural resource use plan for the coastal zone by 1975. The plan is to be in the form of a legislative proposal. To accomplish this task full cooperation of state and federal agencies, as well as local government units is required; in addition a massive citizen involvement is essential at the outset. Most of Oregon's estuaries are now utilized in the multi-use concept which includes lumbering and recreation, both essential to maintain a year-round economic balance. State measures have helped maintain the quality of the coastal zone even though wetlands and marshlands are as yet not identified. The development of policies and standards based on the carrying capacities of the natural resources should insure their protection. (See also W74-07491) (Auen-Wisconsin)
W74-07500

6F. Nonstructural Alternatives

BACKGROUND SURVEY. SURFACE DRAINAGE PROGRAM, MADISON, SAINT CLAIR, MONROE AND RANDOLPH COUNTIES, ILLINOIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 4A.
W74-07066

THE RELATIONSHIP OF LAND USE TO WATER USE IN SAN ANTONIO, TEXAS,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-07067

FLOOD PLAIN INFORMATION-NEUSE AND TRENT RIVERS AND JACK SMITH CREEK, NEW BERN, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07073

FLOOD PLAIN INFORMATION-NEUSE RIVER AND BUFFALO CREEK, SMITHFIELD, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07074

FLOOD PLAIN INFORMATION: BURDENS AND TWO BOTTLE CREEKS AT RESEARCH TRIANGLE AREA, DURHAM COUNTY, NORTH CAROLINA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07075

FLOOD PLAIN INFORMATION - GLADE CREEK, VINTON, VIRGINIA.
Army Engineer District, Wilmington, N.C.
For primary bibliographic entry see Field 4A.
W74-07076

STATE FLOOD CONTROL PROGRAM.
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4A.
W74-07111

FLOOD PROOFING DECISIONS WITH UNCERTAIN EVENTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 6A.
W74-07299

6G. Ecologic Impact Of Water Development

LANDSCAPE COMPARTMENTALIZATION: AN ECOLOGICAL APPROACH TO LAND USE PLANNING,
Duke Univ., Durham, N.C. School of Forestry.
J. E. Wuenscher, and J. M. Starrett.
Available from the National Technical Information Service as PB-231 554, $4.50 in paper copy, $1.45 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No. 89, (UNC-WRRI-74-89), December 1973. 107 p, 22 fig, 38 ref. OWRR A-062-NC(1). 14-31-0001-3833.

Descriptors: Planning, *Environmental control, *Land use, Ecosystems, Land development, Land management, *North Carolina, Landscaping, *Preservation, Ecology, Multiple-purpose projects.
Identifiers: Symaps, *Landscape compartmentalization, *Eno River(NC), Durham(NC), Durham County(NC), Orange County(NC).

Basic objectives were to explore the use of the 'ecosystem concept' in land use planning and to develop methods of ecologically based planning. Basic ecosystem processes are reviewed and interpreted as services provided by natural systems to the human communities. A series of guidelines is presented for the use of ecosystem concepts in planning. Methods are developed and described for the use of the 'Landscape Compartmentalization' approach in which a planning area is divided into four compartments based on natural characteristics of the land and its ecosystems. Factors considered were distance from the nearest water course, slope, agricultural productivity index, forest site index, sub-soil permeability, shrink-swell potential of the soil, depth to bedrock, and position with respect to flood plains. The 'Protective Compartment' includes areas that must be protected from intensive use to maintain natural processes and environmental quality. 'The Productive Compartment' includes highly productive agricultural and forest land. 'The Urban Compartment' is composed of land well suited for intensive development. Remaining land is placed in the 'Multiple Use Compartment' and may be suitable locally for any prospective use. The compartmentalization method is applied to a specific land area--the Eno River Basin near Durham, North Carolina. (McJunkin-North Carolina)
W74-07053

ECOLOGY AND PRODUCTIVITY OF STRIP-MINE AREAS IN MERCER COUNTY, PENNSYLVANIA,
Grove City Coll., Pa. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W74-07055

PROCEDURES AND PROGRAMS TO ASSIST IN THE ENVIRONMENTAL IMPACT STATEMENT PROCESS,
California Univ., Berkeley. Inst. of Urban and Regional Development.
For primary bibliographic entry see Field 6B.
W74-07061

REGIONAL ENVIRONMENTAL REFERENCE.
Denver Regional Council of Governments, Colo.
Available from the National Technical Information Service as PB-221 295; $10.25 in paper copy, $1.45 in microfiche. Final report DRCOG-73-003, May, 1973. 210 p. Colo. P-105.

Descriptors: *Bibliographies, Environment, *Environmental effects, *Environmental control, Environmental engineering, *Colorado, Regional development, Air pollution, Air pollution effects, Climatology, Meteorology, Oceanography, Conservation, Fish, Wildlife, Flood plain, Recreation, Geology, Minerology, Soils, Urbanization, Solid wastes, Water quality, Vegetation, Water resources, Pesticides, Energy, Remote sensing.
Identifiers: *Denver(Colo), *Regional environmental references, Environmental Impact Statements.

This bibliography contains 1450 regional environmental references, with special emphasis on publications of interest to the Colorado Front Range communities. Entries are categorized under fourteen major headings, including air pollution; climatology, meteorology, and oceanography; conservation; environment and ecology; fish and wildlife; flood plain; geology; recreation; soils and minerals; solid waste management; vegetation; wastewater and water quality; water resources; and energy, pesticides, and remote sensing. Subheadings under environment-ecology include environmental assessments, impact statements, legislation, planning and policy, preservation and urbanization. Each document entry lists a location in a Colorado library (Denver Regional Council of Governments, Colorado University, Colorado State University, Denver Public Library, Colorado Water Conservation Board, and Municipal Government Reference Center). Maps and overlays prepared by the Regional Transportation District and by the Denver Regional Council of Governments are listed in a graphics section. (Grden-North Carolina)
W74-07085

SIERRA CLUB V. FROEHLKE (INJUNCTION ACTION AGAINST RESERVOIR PROJECT).
For primary bibliographic entry see Field 6E.
W74-07113

CALCASIEU RIVER AT COON ISLAND, LOUISIANA, SHIP CHANNEL (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8A.
W74-07118

AGANA SMALL BOAT HARBOR, AGANA, GUAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 4A.
W74-07294

SMALL BEACH EROSION CONTROL PROJECT, LEWES, DELAWARE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 4A.
W74-07295

ENVIRONMENTAL IMPACT ANALYSIS: AN EXAMINATION OF THREE METHODOLOGIES,
Wisconsin Univ., Madison. Dept. of Agricultural Economics.
M. L. Warner.
Available from the National Technical Information Service as PB-231 763 $6.50 in paper copy, $1.45 in microfiche. Ph.D. Thesis, 1973. 248 p, 10 fig, 9 tab, 119 ref, 4 append. OWRR B-057-WIS (2) 14-31-0001-3354.

Descriptors: *Environmental effects, *Legislation, *Water quality, Federal Water Pollution Control Act, Law enforcement, *Regulation, *Water policy, *Planning, *Idaho.

The National Environmental Policy Act of 1969 (NEPA) required the filing of environmental impact statements by Federal agencies proposing major actions significantly affecting the water quality of the human environment. This research suggests bases for the evaluation and further development of methodologies used to prepare impact statements. Three methodologies are critically analyzed. They are: the 'Lepold approach,' suggested by Luna B. Leopold, and others, the 'Battelle approach,' developed at Battelle's Columbus Laboratories for the U.S. Bureau of Reclamation, and the 'WRC approach,' contained in the 'Proposed Principles and Standards for Planning Water and Related Land Resources' of the U.S. Water Resources Council. Specific criteria for methodology evaluation are developed within the areas of: technical ecological content, practical applicability, and political utility. These criteria are designed to emphasize a 'full-disclosure law' interpretation of NEPA. The methodologies are examined using each set of criteria in turn. To provide a more concrete setting for this analysis, a test case involving a proposed U.S. Bureau of Reclamation water resources development project in Southwest Idaho was used. Data collection consisted of a point-by-point comparison of criteria and related desirable characteristics to each methodology. These data are analyzed for overall methodological conformance to the criteria to yield conclusions on the strengths and weaknesses of the methodologies. For political utility criteria, conclusions are based upon a model and theory of the Federal reclamation project policy-making process.
W74-07339

DEVELOPMENT OF A DECISION ROOM FOR ENVIRONNTAL STUDIES, (FEASIBILITY STUDY),
Datametric C'OR H, McLean, Va.
J. G. Moore.
Available from the National Technical Information Service as PB-231 864, $6.50 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report EPA-600/5-73-011, June 1973. 61 p, 10 fig. EPA Program Element 1HA097. Grant 801522.

Descriptors: *Decision making, *Simulation analysis, *Management, Model studies, *Environmental effects, *Research facilities, Facilities, Legal aspects, Data processing, Information retrieval, *Evaluation.

Existing 'Decision Room' facilities were studied to determine the initial feasibility of constructing a 'Decision Room' facility for development and use of environmental simulations. Through presentation of the simulations, public officials would be apprised of environmental measurements and could view the simulated consequences of decision making and legislative policy inputs. The study concluded that 'Decision Room' technology is feasible and recommends a 'Research and Analysis Facility' oriented to the development of a prototype facility and its supporting capabilities as an appropriate first step for EPA. The architectual renderings of such a facility are presented. The study indicates that recent developments in computer based technologies have so improved information processing, storage, retrieval, and presentation that EPA requirements involving large amounts of complex information handling in these areas can be met. (EPA)
W74-07371

POSSIBLE EFFECTS OF CONSTRUCTION AND OPERATION OF A SUPERTANKER TERMINAL ON THE MARINE ENVIRONMENT IN NEW YORK BIGHT,
State Univ. of New York, Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W74-07488

ENVIRONMENTAL QUALITY AND ITS EVALUATION,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5G.
W74-07533

7. RESOURCES DATA

7A. Network Design

A SYSTEMS ANALYSIS OF WATER QUALITY SURVEY DESIGN,
Clemson Univ., S.C. Coll. of Engineering.
For primary bibliographic entry see Field 5B.
W74-07310

7B. Data Acquition

BROAD SPECTRUM MICROWAVE SYSTEMS FOR REMOTELY MEASURING SOIL MOISTURE CONTENT,
Arkansas Univ., Fayetteville. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2G.
W74-07052

AN IMPROVED CORE CATCHER FOR THE KIEL BOX CORER ('KASTENLOT'),
Kiel Univ. (West Germany). Geologisch-Palaeontologisches Institut und Museum.
F. Werner.
Marine Geology, Vol 15, No 5, p M59-M65, December 1973. 3 fig, 3 ref.

Descriptors: *Bottom sampling, *Cores, *Core drilling, *Sampling, *Bottom sediments, Equipment.
Identifiers: Kiel box corer.

The efficiency of the Kiel box corer ('Kastenlot') is dependent upon the mechanical properties of the sediments. To avoid this limitation, a new core catcher was constructed and has been tested for several years in both shallow and deep-water sediments. The essential part of this catcher is a reinforced canvas curtain which is pulled slantwise through the core before the corer is pulled out of the sediment. (Knapp-USGS)
W74-07159

AN INNOVATIVE AUTOMATIC STREAM GAGING METHOD,
Oklahoma Univ., Norman. School of Engineering and Environmental Science.
J. F. Harp.
Journal of Hydrology, Vol 21, No 1, p 27-31, January 1974. 2 fig, 3 ref.

Descriptors: *Stream gages, *Water measurement, *Current meters, *Instrumentation, Automation, Discharge measurement, Gaging stations.

An extension of the moving boat method for stream gaging allows intermediate sized streams to be gaged automatically, by means of a moving meter, by remote control with no operator at the point of the velocity measurement. No velocity magnitude measurement is required, only an angle measurement and a known input constant velocity of traversing meter. The technique combines the new technique with classical methodology to produce a reliable field measurement of streamflow rates in a short time. (Knapp-USGS)
W74-07181

PHOTOMETRIC DETERMINATION OF MANGANESE IN WATER BY USING O-TOLIDINE,
Water Management Board, Brno (Czechoslovakia).
For primary bibliographic entry see Field 2K.
W74-07315

ON THE DETERMINATION OF TURBULENT DIFFUSIVITY IN SHALLOW WATERS BY AERIAL PHOTOGRAPHY OF FLOATING MARKERS,
Texas A and M Univ., College Station. Dept. of Meteorology.
For primary bibliographic entry see Field 2H.
W74-07316

DETERMINATION OF CHLORINATED INSECTICIDES IN SUSPENDED SEDIMENT AND BOTTOM MATERIAL,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W74-07317

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUB-OPTIMIM WEATHER,
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-07342

SURFACE TEMPERATURES OF LAKE ERIE,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 2H.
W74-07415

PORTABLE REFLECTANCE METER FOR ESTIMATING CHLOROPHYLL CONCENTRATIONS IN LEAVES,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
E. F. Wallihan.
Agronomy Journal, Vol 65, No 4, p 659-662, July-August, 1973. 4 fig, 2 tab, 7 ref.

Descriptors: *Chlorophyll, *Measurement, *Leaves, *Citrus fruits.

The need to measure changes of chlorophyll concentration in citrus leaves required a nondestructive method of analysis applicable to field use. Light reflectance in the wavelength region of 600 nm had been shown to be useful but existing reflectance meters were too bulky for field use and generally required line power. The instrument described here is battery operated, compact, and measures light reflectance in a band of wavelengths from 610 nm to 700 nm from four miniature incandescent lamps. Arrangement of the light unit on a spring clamp permits readings in the field on several leaves per minute. Calibration against measured chlorophyll concentrations yields a log curve revealing maximum sensitivity at low chlorophyll concentrations. Tests on leaves from iron-deficient orange trees showed the coefficient of variability to be in the vicinity of plus or minus 15%. By reading 20 replicate leaves, sampling errors were compensated sufficiently to give precision of about plus or minus 3%. (Skogerboe-Colorado State)
W74-07437

A RAINFALL-RUNOFF MODEL BASED ON THE WATERSHED STREAM NETWORK,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07464

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 5C.
W74-07484

CALIBRATING A WATER YIELD MODEL FOR SMALL UNGAGED WATERSHEDS,
Kentucky Dept. of Natural Resources, Frankfort. Division of Water.
For primary bibliographic entry see Field 2A.
W74-07519

A GROUNDWATER PROFILE SAMPLER,
Forest Service (USDA), Cadillac, Mich. North Central Forest Experiment Station.
For primary bibliographic entry see Field 2F.
W74-07523

SPECIAL REPORT: SEMICONDUCTOR MEMORIES ARE TAKING OVER DATA-STORAGE APPLICATIONS,
W. B. Riley.
Electronics, Vol 46, No 16, p 75-90, August 2, 1973. 4 fig, 2 tab.

Descriptors: *Data storage and retrieval, *Computers, Reliability, Electronic equipment.
Identifiers: *Semiconductors, Controllers, Calculators, Memory(Computers).

Semiconductor memories are finding wide application in computer, controller, and calculator design. A general review is provided of the current status of semiconductors. Described are what is available, who is using the equipment, some criteria for selecting equipment, some problems that have been encountered, and some of the benefits from the new semiconductor technology. There are 16 different types of semiconductors, divided into two classes in any of four different and independent ways. The divisions are dynamic and static circuits, bipolar and metal-oxide-semiconductor (MOS) technology, read-write and read-only memories and random-access and serial-access memories. Not all 16 types are, however, purchasable or even practical. (Holoman-Battelle)
W74-07553

A DIRECT COMPARISON OF SATELLITE AND AIRCRAFT INFRARED (10 MICROMETERS-12 MICROMETERS) REMOTE MEASUREMENTS OF SURFACE TEMPERATURE,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
C. M. R. Platt, and A. J. Troup.
Remote Sensing of Environment, Vol 2, No 4, p 243-247, 1973. 2 fig, 4 tab, 8 ref.

Descriptors: *Remote sensing, *Measurement, *Water temperature, *Sea water, *Satellites(Artificial), *Aircraft, Surface waters, Data collections, Infrared radiation, Australia, Water quality, Water vapor, Vapor pressure.
Identifiers: Comparative data, Radiometers, Nimbus IV Satellite THIR.

Nimbus IV Satellite THIR (10 micrometers-12 micrometers) sea surface temperature data for a region off the NE coast of Australia were compared with data taken over the same region and period with a radiometer detecting in the same special interval flown aboard a DC 3 aircraft at altitudes ranging from the surface to 3 km. When the aircraft ascended from the surface to above the tradewind inversion, the apparent sea surface temperature decreased by 2.6 C, on average. An empirical formula for the water vapor absorption coefficient, which include a component proportional to the water vapor pressure, was used successfully to account for the apparent temperature decrease. From above the inversion, the aircraft radiometer sea surface temperatures were slightly greater than the Nimbus IV THIR sea surface temperatures. This discrepancy was accounted for by residual water vapor between the inversion and the tropopause, nadir angles of viewing from Nimbus IV, and the slight mismatch between the spectral filters of the two instruments. (Holoman-Battelle)
W74-07578

7C. Evaluation, Processing and Publication

CRITICAL ANALYSIS OF THE ALTERNATING DIRECTION IMPLICIT METHOD OF AQUIFER ANALYSIS,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W74-07154

APPLICATION OF GEOCHEMISTRY TO THE SEARCH FOR CRUDE OIL AND NATURAL GAS,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W74-07161

LINE INTERSECTION METHOD FOR ESTIMATING DRAINAGE DENSITY,
British Columbia Univ., Vancouver. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W74-07174

A SYNTHETIC MODEL FOR DAILY STREAMFLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W74-07179

AN INVESTIGATION OF FLOODS IN HAWAII THROUGH SEPTEMBER 30, 1973,
Geological Survey, Honolulu, Hawaii.
For primary bibliographic entry see Field 2E.
W74-07185

RECORDS OF GROUND-WATER LEVELS IN WYOMING, 1940-1971,
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 4B.
W74-07186

WATER RESOURCES INVESTIGATIONS IN NEW YORK, 1973.
Geological Survey, Albany, N.Y.
Water Resources Investigations Folder, 1 sheet, 1973. 5 fig, 1 map, 2 tab.

Descriptors: *New York, *Investigations, *Water resources, Groundwater, Surface waters, Water quality, Hydrogeology, Water supply, *Bibliographies.
Identifiers: Water resources investigations(NY).

This folder contains a brief description of the water-resources investigations in New York in which the U.S. Geological Survey participates, and a list of selected references. The water-resources program of the U.S. Geological Survey consists of the collection of basic information through its hydrologic-data stations, areal hydrologic and interpretive studies, and research projects. (Knapp-USGS)
W74-07188

WATER RESOURCES OF THE TAUNTON RIVER BASIN SOUTHEASTERN MASSACHUSETTS,
Geological Survey, Washington, D.C.
J. R. Williams, D. F. Farrell, and R. E. Willey.
For sale by USGS, Washington, D.C. 20244; Price $1.25 per set. Hydrologic Investigations Atlas HA-460, 3 sheets, 1973. 31 fig, 6 tab, 2 map, 31 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Massachusetts, Glacial drift, Streamflow, Water quality, Iron, Manganese,

Water yield, Water utilization, Groundwater basins, *Maps.
Identifiers: *Taunton River basin(Mass).

Information is provided on the water resources of the Taunton River basin, Massachusetts. The data will assist in locating additional water supplies, planning, and protecting water supplies. The basin's drainage area of 528 square miles includes at least 50 square miles of swamps and about 23 square miles of lakes and ponds. Six of the ponds furnish an average of 24 mgd to New Bedford and Taunton. The largest potential source of surface water is the Taunton River which, if treated, could furnish about 80 mgd from a reservoir in the estuary between Somerset and Freetown. Streamflow from the basin during the period 1931-65 averaged about 230 billion gallons per year, or about 57% of the average annual precipitation. In 1967 the total water pumped from streams, lakes, and surface-water reservoirs was about 178 billion gallons. Approximately 25 square miles of the basin is underlain by permeable material that is capable of yielding 300 gpm or more per well. Groundwater in some of the area cannot be used, however, because of urbanization, proximity of potential sources of pollution, or economic reasons. Many of the high-yielding parts of the aquifer system are located in thick, permeable stratified glacial drift which fills depressions in the underlying surface of till and bedrock. These deposits are the sources of the 3.1 billion gallons of groundwater pumped in 1967 by 21 cities, towns, and water districts, and for the 1.2 billion gallons pumped by industrial, institutional, domestic, and agricultural wells. The water in streams, reservoirs, and wells is generally soft, acid to slightly acid, and low in dissolved solids. (Knapp-USGS)
W74-07190

OPTIMAL LINEAR EXTRAPOLATION OF LEVEL FLUCTUATIONS OF CLOSED WATER BODIES (OPTIMAL'NAYA LINEYNAYA EKSTRAPOLYATSIYA KOLEBANIY UROVNYA ZAMKNUTYKH VODOYEMOV),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 4A.
W74-07195

A COMPUTER SIMULATION MODEL FOR FLOOD PLAIN DEVELOPMENT. PART II: MODEL DESCRIPTION AND APPLICATIONS,
INTASA, Menlo Park, Calif.
For primary bibliographic entry see Field 6A.
W74-07296

DATA FOR MUNICIPAL WELLS IN THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 4B.
W74-07320

WATER-RESOURCES INVESTIGATIONS IN TEXAS, FISCAL YEAR 1974.
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07321

ANNUAL COMPILATION AND ANALYSIS OF HYDROLOGIC DATA FOR URBAN STUDIES IN THE SAN ANTONIO, TEXAS METROPOLITAN AREA, 1971,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 2E.
W74-07323

A COMPUTER SYSTEM FOR STORAGE AND RETRIEVAL OF HYDROGEOLOGICAL DATA FROM WELL RECORDS,
Natural Environment Research Council, London (England). Inst. of Geological Sciences.
B. I. Harvey.
Report No 73/18, 1973. 34 p, 4 fig, 7 ref, 4 append.

Descriptors: *Data storage and retrieval, *Computer programs, *Water wells, Data collections, Data process, Basic data collections.
Identifiers: Great Britain.

Computer programs are given to operate a fixed-format system for the storage and retrieval of data abstracted from the well records in the Hydrogeological Department of the Institute of Geological Sciences of Great Britain. These data are stored on tape in nine interrelated lists which can be interrogated to retrieve detailed information relating to five primary data groups--record identity, well construction, hydrogeological data, stratigraphical information and hydrogeochemical data. Examples of the use of the retrieval programs are given, together with sample pages of metricated well inventories compiled by a modified input program. (Knapp-USGS)
W74-07328

PLANNING AND OPERATION OF URBAN WATER QUALITY MANAGEMENT SYSTEMS,
Cornell Univ., Ithaca, N.Y.
For primary bibliographic entry see Field 5D.
W74-07334

INSTRUMENTATION FOR ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM (TRINITY RIVER BASIN, TEXAS) REAL-TIME ENGINEERING MANAGEMENT OF A MULTI-PURPOSE RIVER BASIN SYSTEM,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 4A.
W74-07369

SOME GENERALIZED BETA DISTRIBUTIONS OF THE SECOND KIND HAVING DESIRABLE APPLICATION FEATURES IN HYDROLOGY AND METEOROLOGY,
Colorado State Univ., Fort Collins. Dept. of Statistics.
For primary bibliographic entry see Field 2A.
W74-07412

ALGEBRAIC BOUNDEDNESS OF SAMPLE STATISTICS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2A.
W74-07413

JUST A MOMENT,
IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 2A.
W74-07414

ECONOMIC DAMAGES FROM RESIDENTIAL USE OF MINERALIZED WATER SUPPLY,
Environmental Protection Agency, Washington, D.C. Economic Analysis Div.
For primary bibliographic entry see Field 5C.
W74-07417

PARAMETER IDENTIFICATION IN FIELD PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical Engineering.
T. M. Simundich.
Water Resources Research, Vol 10, No 1, p 73-79, February 1974. 1 fig, 6 tab, 23 ref. NSF Grant GK-31463X1 OWRR B-150-CAL(1).

Descriptors: *Data collections, *Hydrologic data, *Systems analysis, *Parametric hydrology, Mathematical models, Optimization.

In water resources field problems, unknown physical parameters in the governing partial differential equations must be determined before relevant numerical results can be obtained. The identification of these parameters is formulated as a minimization problem in which the function to be minimized is a least squares comparison between the model equation and the systems responses (the field data). The minimization technique utilized is the Fletcher-Powell method. Three typical water resources field problems are used as examples to demonstrate the technique. (Knapp-USGS)
W74-07428

GENERATION MODELS FOR SYNTHETIC ANNUAL AND MONTHLY FLOWS FOR SOME INDIANA WATERSHEDS,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07431

A COMPUTER ATLAS OF HYDROLOGIC AND GEOMORPHOLOGIC DATA FOR SMALL WATERSHEDS IN INDIANA,
Purdue Univ., Lafayette, Ind. School of Civil Engineering.
For primary bibliographic entry see Field 2A.
W74-07432

STREAMFLOW SIMULATION: 3. THE BROKEN LINE PROCESS AND OPERATIONAL HYDROLOGY,
Ecole Polytechnique, Montreal (Quebec). Hydraulic Div.
For primary bibliographic entry see Field 2A.
W74-07520

A NOTE ON THE USE OF SPECTRAL ANALYSIS TO DETECT LEADS AND LAGS IN ANNUAL CYCLES OF WATER QUALITY,
Colorado Univ., Boulder. Dept. of Economics.
J. M. Dowling.
Water Resources Research, Vol 10, No 2, p 343-344, April 1974. 1 tab, 4 ref.

Descriptors: *Time series analysis, *Water quality, Statistics, Statistical methods, *Input-output analysis.
Identifiers: *Spectral analysis.

Spectral analytic phase statistics can be interpreted as absolute delays in physical time only if the two series are related as input and output by a simple delay process. For all other linear input-output systems it is incorrect to interpret phase as if there is a simple delay between input and output series. To clarify interpretation of phase leads and lags, an explicit model should be constructed in the time domain. Without such clarification, ambiguities will be present in the interpretation of phase statistics. (Knapp-USGS)
W74-07522

SPECIAL REPORT: SEMICONDUCTOR MEMORIES ARE TAKING OVER DATA-STORAGE APPLICATIONS,
For primary bibliographic entry see Field 7B.
W74-07553

NUMERICAL ANALYSIS OF HANSENULA, PICHIA AND RELATED YEAST GENERA,
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.
For primary bibliographic entry see Field 5A.
W74-07583

8. ENGINEERING WORKS

8A. Structures

CALCASIEU RIVER AT COON ISLAND, LOUISIANA, SHIP CHANNEL (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
Available from National Technical Information Service, Springfield, Va 22151, as EIS-LA-73-0467-F, $5.25 paper copy, $1.45 microfiche. November 30, 1972. 63 p, 1 tab, 6 map.

Descriptors: *Channel improvement, *Dredging, *Environmental effects, Construction, Hydraulics, Water quality, Land use, Fish, Wildlife, Pollution, Rivers, *Louisiana, Water pollution, Spoil banks, Navigation, Ships, Turbidity, Channels.
Identifiers: *Environmental Impact Statements, *Coon Island(La).

The environmental impact and adverse effects are described of the construction of a ship channel and turning basin in the Coon Island channel to allow for more efficient use of the channel by larger and deeper-draft vessels. The construction requires the removal and disposal of large amounts of dredged material from the channel. Potential adverse environmental effects include air and water pollution by vessels and industry on the enlarged channel. The use of hydraulic dredges during construction and maintenance may degrade the water quality of the Calcasieu River by inducing temporary turbidity. No significant aesthetical or environmental changes in land use are associated with the project; because of the increased turbidity there will be unavoidable adverse impact to the fish, wildlife, water, and recreational resources. The resultant industrial expansion will require a land-use change. Alternatives to this action include retention of the existing ship channel, channel enlargement or no ship channel at all. (Daniels-Florida)
W74-07118

INFLATABLE DAMS AND DAM UNITS,
D. C. E. Fish.
U.S. Patent No 3,786,638, 4 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 918, No 4, p 1364, January 22, 1974.

Descriptors: *Patents, *Surges, *Dams, *Tides, Water control, Saline water instrusion.
Identifiers: Inflatable dams.

Inflatable dams are designed to protect the upper reaches of a river from occasional tidal surges. The dam unit comprises an elongated flexible, watertight envelope. The dam is raised by inflating the envelope with water. The filled envelope becomes a barrier which spans the river from side to side and lies between the high water level of the 'upper pool' that forms on the tidal side of the envelope and the low water level that forms in the lower pool on the source side. The envelope is inflated from its collapsed state by a pumping station on the river bank which draws water from the upper pool through a pipe by way of a filter, and discharges it through a pipe to an inlet in the envelope. (Sinha - OEIS)
W74-07210

COMBINED SEWER OVERFLOW SEMINAR PAPERS.
Edison Water Quality Research Lab., N.J.
For primary bibliographic entry see Field 5D.
W74-07255

PRESSURE SEWERS,
New York State Dept. of Environmental Conservation, Alabany. Environmental Quality Research and Development Unit.
For primary bibliographic entry see Field 5D.
W74-07259

SCREENING/DISSOLVED-AIR FLOTATION TREATMENT OF COMBINED SEWER OVERFLOWS,
Envirex, Inc., Milwaukee, Wis. Environmental Sciences Div.
For primary bibliographic entry see Field 5D.
W74-07262

ECONOMIC SIZE SELECTION FOR PVC PIPELINES,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
J. M. Steichen, and J. E. Garton.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 6, p 1117-1120, November 1973. 14 fig, 1 tab, 3 ref.

Descriptors: Economics, *Pipelines, *Costs, *Size, *Equations, Flow rates, Interest rates, Pumping, Hazen-Williams equation, Optimization, Methodology, Systems analysis.
Identifiers: *Nomographs, Least-cost, Friction head, Pipe diameter.

Nomographs for selecting the most economical size of PVC pipe are considered for the design engineer. Two basic costs are involved in the operation of a piping system: the annual cost of owning the pipe and the cost of pumping. Small pipe has a low initial cost; however, the cost of pumping in small pipes is large due to the high friction loss. Large pipe will result in lower pumping costs, but the initial cost of the pipe will be higher. Equations developed for the total annual cost show that for a given flow rate and power cost, there is a least-cost diameter. These equations are developed and the results summarized in a series of nomographs, one for each class of pipe. The Hazen-Williams formula has been used to find the friction loss. (Bell-Cornell)
W74-07303

OPTIMUM DESIGN HEIGHT OF COFFERDAMS,
Imperial Government of Iran, Tehran. Plan Organization.
F. Neghabat, and R. M. Stark.
Ocean Engineering, Vol 2, No 5, p 231-241, November 1973. 6 fig, 2 tab, 4 ref.

Descriptors: *Cofferdams, *Design, *Height, Costs, Construction, *Flooding, *Risks, Probability, Poisson ratio, Reliability, Hydrologic data, Economics, Mathematical models, Operations research, Ohio River.
Identifiers: *Cost minimization, Sensitivity analysis.

The cost of cofferdams as a function of design height is described by a basic lot size model. Cofferdams function in a random environment characterized by fluctuations in surrounding water levels. Augmenting the height of the structure diminishes the chance of flooding and its associated costs but increases the cost of construction. Design height, therefore, is determined through achievement of an appropriate balance between the construction costs and flood risk costs. In a simple algebraic model for the total expected cost of the structure, the construction and flood risk costs are expressed in terms of design height; total expected cost minimization is the design criteria. Using an exponential function for the expected number of floods, together with Poisson assumptions, an expression is derived for the probability of no flooding. From this expression a reliability chart (for a given site) is constructed that can be used to estimate the flooding risk for a fixed design height and period. By minimizing the cost objective function, a design chart is presented giving optimum design height in terms of such parameters as (estimated) daily flooding cost, construction cost per unit height, average flood duration, and mean and variance of the hydrological data. Sensitivity of the solution to errors in estimating model parameters is discussed. (Bell-Cornell)
W74-07304

ECONOMIC EVALUATION AND DETERMINATION OF PLANT CAPACITY AND DAM HEIGHT,
Public Power Corp., Athens (Greece).
D. A. Xirokostas.
Water Power, Vol 26, No 1, p 17-22, January 1974. 6 fig, 5 ref.

Descriptors: Water resources development, *Economics, *Evaluation, *Dams, *Height, *Powerplants, *Cost-benefit analysis, Optimization, Design, Costs, Energy, Methodology, Fuels, Equations, Systems analysis.
Identifiers: Hydro plants, Installed capacity.

Using a revised definition of benefit-cost ratio, a method is developed for comparing different hydro plants to obtain optimum values of dam height and installed capacity; it is assumed that the main role of future hydro installations will be to cover peak and high-load requirements. The proposed definition is given by the ratio of the annual cost of alternative plant plus the cost of replacing the secondary energy divided by the annual cost of the hydro plant, where the annual cost of the alternative thermal plant is determined by considering that it replaces only the primary energy of the hydro plant. The secondary energy is assessed separately with the average incremental cost of the fuel consumed by the system's oil-fired steam-turbine stations since this is exactly what constitutes the contribution of the secondary energy to the system. The proposed method is based first on designing the dam height and installed capacity to the natural sizes and capacity factors at which they will render their maximum economically-justified service to a system, and then on incorporating them into the system on the dates when these services will be required. The method allows determination of the parameters of hydro plants separately from their incorporation into a system. The dam height and installed capacity are determined so as to maximize the difference between benefits and costs, provided that no physical or technical limits on these variables are exceeded, thus restricting the solution to the feasible optimum. (Bell-Cornell)
W74-07305

CONTRIBUTIONS TO THE CALCULATION OF THE ROOD TERRITORY WIDTH AND THE TRANSVERSAL SECTION UNDER THE RETENTION LEVEL AT THE WEIRS AND DAMS OF FISHERY PURPOSES, (IN RUMANIAN),
Institutul Politehnic din Galati (Rumania).
For primary bibliographic entry see Field 8I.
W74-07448

STATE OF THE ART OF FLOATING BREAKWATERS,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. P. Richey, and R. E. Nece.
In: Proceedings 2nd Annual Technical Conference on Estuaries of the Pacific Northwest, March 16-17, 1972. Oregon State Univ., Corvallis (Engineering Experiment Station Circular No 44), p 74-86 (1972). 10 fig, 18 ref.

Descriptors: *Floats, *Ocean waves, *Breakwaters, Hydraulic structures, Barriers, Design, Marinas, Costs, *Washington.
Identifiers: *Floating breakwaters, Puget Sound(Wash.).

Shutdown time of weather dependent, waterborne activities like construction, logging, cargo handling and boating could be reduced by floating, transportable breakwaters. Also the infant mariculture industry might find more sites suitable for its special facilities if suitable wave protection could be provided. In view of their potential uses it is timely to reexamine the floating breakwater with regard to types, transmission characteristics, anchoring forces, economics, and multiple-use prospects. The performance characteristics of

major concern for floating breakwaters are the transmission coefficients, anchor forces, and motion. Prospects for a floating breakwater to be competitive with fixed structures appear to be favorable at sites where conventional forms are not suitable and where the exposure to the extreme wave events is excluded by restricted seasonal use. Four points in favor and three points detracting from their use are given. Areas of research which will aid in refining the current procedures for design are theory development, systematic measurements, field experience, cost-effective analyses, and considerations of the three-dimensional, random aspects of wind-generated waves. (See also W74-07491) (Jones-Wisconsin)
W74-07498

8B. Hydraulics

ATTENUATION OF WATER WAVES AND CONTROL AND UTILIZATION OF WAVE-INDUCED WATER MOVEMENTS,
FMC Corp., San Jose, Calif. (assignee).
D. L. Hammond.
U.S. Patent No 3,785,159, 11p, 31 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 918, No 3, p 972, January 15, 1974.

Descriptors: *Patents, *Barriers, *Breakwaters, *Shore protection, *Pollution abatement, Sedimentation, Beach erosion, Waves(Water), Equipment.

A series of curved vane-like structures are placed across the path of incident waves to reduce their height, speed and period, and to change the wave-induced water movements. They are positioned either horizontally beneath the mean water line or sloping upward at an angle with the upper portion exposed above the water's surface. They can be used as a breakwater or as a diverter. The currents produced by the structures may be useful but not limited to the dispersal of waters polluted by chemical, thermal or sewage discharges, to effect beach replenishment, and even to generate electric or hydraulic power. The structures can also be used as a dynamic barrier against the spread of floating contaminants such as oil or solid debris. (Sinha - OEIS)
W74-07204

APPARATUS FOR RECORDING SWELL FREQUENCY AND PROPAGATION DIRECTION OF WAVES,
Agence Nationale de Valorisation de la Recherche, Courbevoie (France). Assignee.
L. Erdely.
U. S. Patent No 3,765,236, 2 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 915, No 3, p 827, October 16, 1973.

Descriptors: *Patents, *Waves(Water), *Coastal structures, Equipment, Measurement, Gauges, Gauging stations.
Identifiers: *Swell frequency, *Swell propagation.

During the design of coastal structures, it is necessary to be able to predict the forces to which the structures would be subject. An installation is described for swell frequency and propagation direction recording. The swell collector is made up of a water gauge which is partially submerged. The collector is connected, by a rigid shaft, to a ballast. The thrust center of the unit is connected by a flexible connection to an anchoring device and the collector enclosing a magnetic compass on a horizontal balance on a pivot and a counter of the number of movements of the water gauge with respect to the compass which also identified the direction of movements. (Sinha-OEIS)
W74-07224

RECENT INVESTIGATIONS IN STRATIFIED FLOWS RELATED TO ESTUARIAL HYDRAULICS,
Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.
For primary bibliographic entry see Field 2L.
W74-07226

SOLUTIONS FOR LATERAL OUTFLOW IN PERFORATED CONDUITS,
Ghent Rijksuniversiteit (Belgium). Dept. of Civil Engineering.
J. Berlamont, and A. Van der Beken.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY9, p 1531-1549, September, 1973. 11 fig, 3 tab, 17 ref.

Descriptors: *Drainage, *Irrigation, Hydraulics, *Pipe flow, Sprinkler irrigation, Sewage disposal, Water distribution(Applied), *Conduits.

General solutions are presented for obtaining a uniform lateral outflow, either by varying the perforation area or the cross-sectional area. The distribution of the lateral outflow in a conduit with constant cross section and constant perforation area is analyzed under normalized form. Appropriate flow parameters are introduced which allow for inertia or pressure recovery, velocity distribution, laminar or turbulent out-flow, and laminar and turbulent smooth or rough flow. All results are presented in diagrams. A design rule for nearly uniform discharge under turbulent pipe flow conditions is derived. The agreement between experimental data and the presented solutions, when the velocity correction coefficient is properly chosen, sustains the actual approach. (Skogerboe-Colorado State)
W74-07433

A MIXING CELL MODEL FOR LONGITUDINAL DISPERSION IN OPEN CHANNELS,
Universidad Nacional Autonoma de Mexico, Mexico City. Facultad de Ingenieria.
R. B. Banks.
Water Resources Research, Vol 10, No 2, p 357-358, April 1974. 1 fig, 8 ref.

Descriptors: *Mixing, *Open channel flow, *Dispersion, Model studies, Mathematical models, Turbulent flow.

Mixing is described in a steady uniform flow in an open channel that consists of a series of cells arrayed in a longitudinal direction. At time zero a step function change in concentration is imposed at the origin, and it is assumed that complete mixing then occurs of the cells. The main result is that the longitudinal dispersion coefficient is essentially equal to the product of the flow velocity and the cell length. Relating this result to the well-known dispersion equation, a definition is obtained for the length of a dispersion unit. (Knapp-USGS)
W74-07527

8C. Hydraulic Machinery

HYDROELECTRIC POWER RESOURCES OF THE UNITED STATES, DEVELOPED AND UNDEVELOPED, JANUARY 1, 1972.
Federal Power Commission, Washington, D.C.
December 1972. 126 p, 3 fig, 2 map, 19 tab.

Descriptors: *Hydroelectric power, *Water resources development, *Pumped storage, Hydroelectric plants, Electric power production, Water utilization, *United States.
Identifiers: *Hydroelectric power resources.

As of January 1, 1972, the total potential conventional hydroelectric power capacity of the United States is estimated to be 178.6 million kilowatts, capable of generating an average of about 702 billion kilowatt-hours annually. Approximately 53.4 million kilowatts, or 30% of the total potential, had been developed, with the capability of an average annual generation of about 257 billion kilowatt-hours. Of the remaining undeveloped conventional hydroelectric potential of 125.2 million kilowatts, with a corresponding average annual energy production of about 445 billion kilowatt-hours, about 7.8 million kilowatts were under construction at the beginning of 1972. The total developed pumped storage capacity, as of January 1, 1972, amounted to 3.9 million kilowatts, including 2.6 million kilowatts in pure pumped storage plants and 1.3 million kilowatts in combined plants. A total of 6.0 million kilowatts were under construction in pure pumped storage plants, and 1.4 million kilowatts were under construction in combined plants. Of the major drainages, the North Pacific has the largest amount of both developed and undeveloped hydroelectric capacity, accounting for about one-third of the totals in each case. Among the states, Washington has the largest developed capacity and the largest total potential. Alaska has the largest undeveloped potential. (Knapp-USGS)
W74-07189

THE SWIRL CONCENTRATOR AS A COMBINED SEWER OVERFLOW REGULATOR,
American Public Works Association, Chicago, Ill.
For primary bibliographic entry see Field 5D.
W74-07264

8G. Materials

THE RELATIONSHIP OF POROSITY AND ANGLE OF REPOSE TO MIXTURE PROPORTIONS IN ASSEMBLAGES OF DIFFERENT SIZED MATERIALS,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W74-07330

8H. Rapid Excavation

ANNOTATED BIBLIOGRAPHY OF EXPLOSIVE EXCAVATION RELATED RESEARCH.
Army Engineer Waterways Experiment Station, Livermore, Calif. Explosive Excavation Research Lab.
Available from NTIS, Springfield, Va. 22151 as AD-757 157; Price $6.75 printed copy; $1.45 microfiche. Technical Report E-72-32, July 1972. 220 p.

Descriptors: *Bibliographies, *Explosives, *Excavation, Nuclear explosions, Construction, Explosions, Craters, Engineering, *Research.
Identifiers: *Explosive excavations.

This bibliography contains a description of all reports prepared by the U.S. Army Corps of Engineers Nuclear Cratering Group, the Waterways Experiment Station Explosive Excavation Research Office, and the Waterways Experiment Station Explosive Excavation Research Laboratory from Fiscal Year 1962 through Fiscal Year 1972. The reports address themselves to the many topics associated with the use of chemical and nuclear explosives in excavation projects, and each is described by a brief summary or abstract. Indexing is by subject, author, title, and report number. (Knapp-USGS)
W74-07314

8I. Fisheries Engineering

MUSSEL FISHERY INVESTIGATIONS, TENNESSEE, OHIO, AND GREEN RIVERS,
Kentucky State Dept. of Fish and Wildlife Resources, Frankfort.
J. C. Williams.

Available from NTIS, Springfield, Va. 22151 as COM 72-11317; Price $3.00 printed copy; $1.45 microfiche. Contract report to NOAA, National Marine Fisheries Service, June 1969. 107 p, 16 fig, 29 plate, 30 tab, 33 ref. 4-19-R.

Descriptors: *Fisheries, *Kentucky, *Mussels, *Ohio River, Rivers, Shellfish, *Tennessee River.
Identifiers: Green River(Ky).

A 3-year mussel fishery investigation was instituted on July 1, 1966 on the portions of the Tennessee, Ohio, and Green Rivers that flow in Kentucky. The Ohio and Tennessee Rivers supported populations of commercial mussels. The Green River did not have a mussel fauna abundant enough or in sufficient numbers of legal size individuals to support a commercial mussel fishery. (Knapp-USGS)
W74-07187

A NEW TYPE OF INCUBATOR USED IN THE INDUCED SPAWNING OF PHYTOPHAGOUS FISHES, (IN RUMANIAN),
Statiunea de Cercetari Piscicole, Braila (Rumania).
Cristea Anghel, Elisabeta Cristea, and Jora Ieremia.
Bul Cercet Piscic, Vol 31, No 1/2, p 123-128, 1972. Illus. English summary.
Identifiers: *Fish hatcheries, *Incubators, *Phytophagous fish, *Spawning, *Fish reproduction.

Investigations at the hatchery Perisor-Danube Delta, regarding a new type of incubator used in the induced spawning of phytophagous fishes are presented. The incubator and its working are described. The results obtained and the advantages offered by the new type of incubator for the large production stations of phytophagous fishes by induced spawning in comparison to the Weiss jars usually employed, are shown.--Copyright 1973, Biological Abstracts, Inc.
W74-07434

CONTRIBUTIONS TO THE CALCULATION OF THE ROOD TERRITORY WIDTH AND THE TRANSVERSAL SECTION UNDER THE RETENTION LEVEL AT THE WEIRS AND DAMS OF FISHERY PURPOSES, (IN RUMANIAN),
Institutul Politehnic din Galati (Rumania).
A. Adam.
Bul Cercet Piscic, Vol 31, No 1/2, p 155-159, 1972. English summary.
Identifiers: Calculations, *Dams, *Fishery, Retention level, Territory width, *Transversal sections, *Weirs, Width.

Calculations of the territory width and the transverse section under the retention level at the weirs and dams are given for fishery purposes without drainage, constructed on sandy clay and clay-loam grounds, knowing the water head retained and the value of the slope.--Copyright 1973, Biological Abstracts, Inc.
W74-07448

RELATIONSHIP BETWEEN LOGGING ACTIVITIES AND SALMON PRODUCTION,
Alaska Dept. of Fish and Game, Juneau.
For primary bibliographic entry see Field 4C.
W74-07468

THE FOOD HABITS AND AGE AND GROWTH OF GOLDEYE, HIODON ALOSOIDES (RAFINESQUE), IN BEAVER CREEK, LAKE OAHE, NORTH DAKOTA, 1971-72,
North Dakota Univ., Grand Forks.
P. T. Schadewald.
Available from the National Technical Information Service as COM73-11338, $5.25 in paper copy, $1.45 in microfiche. National Marine Fisheries Service Report No NOAA 73073009, May 1973. 61 p, 5 fig, 20 tab, 28 ref.

Descriptors: *Freshwater fish, *Food habits, *Fish food organisms, *Animal growth, *North Dakota, Seasonal, Crustaceans, Daphnia, Insects, Diurnal distribution, Reservoirs, Spatial distribution, Commercial fish, Fish diets, Copepods, Fish parasites.
Identifiers: *Goldeye, Hiodon alosoides(Rafinesque), Lake Oahe(N.D.).

Food habits and growth of goldeye were studied in Lake Oahe, North Dakota to determine why the fish in that reservoir have better growth and can be harvested commercially while the Lake Sakakawea impoundment produced goldeye of smaller size, which were commercially unacceptable. Food availability may be the key to growth differences. A comparison of results from these two studies should provide a much better understanding of the status of goldeye in both reservoirs. The Beaver Creek site in Lake Oahe was selected as the study area. Stomach contents from 833 goldeye were analyzed to determine bihourly, and spring and summer food habits. Cladocera, principally Daphnia, comprised 75% of the average stomach volume. Frequency of occurrence was 98.4% for Cladocera and 87.2% for Insecta. Young-of-the-year goldeye fed entirely on microcrustaceans. The diet of older age classes was predominantly microcrustaceans, but always included insects. Goldeye were concentrated in surface waters when food was abundant, usually at night. At other times the population seemed to be distributed at all depths. The equation for the length-weight curve was log W = 5.3320 + 3.1211 log TL. K-TL was .9297. (Jones-Wisconsin)
W74-07474

DISEASES OF POND FISHES,
O. N. Bauer, V. A. Musselius, and Y. A. Strelkov.
Available from the National Technical Information Service as TT-72-50070, $5.75 in paper copy, $1.45 in microfiche. Bureau of Sport Fisheries and Wildlife and National Science Foundation, Translation TT-72-50070, 1973. 71 fig, 8 tab, 6 plates, 426 ref. Trans. of Bolezni Prudovykh Ryb.

Descriptors: *Fish diseases, *Ponds, *Epizootiology, Fisheries, Control, Vectors(Biological), Animal pathology, Hosts, Infection, Fish parasites, Treatment, Pathogenic bacteria, Viruses.
Identifiers: *Causative agents, *USSR, Immunity, Symptoms, Diagnosis, Drugs.

A comprehensive discussion of pone fish diseases and their control is presented. Described are diseases which have appeared in the USSR recently as a result of imports, as well as infectious, parasitic, and non-communicable diseases which have become especially dangerous due to current intensifications. Material published both in the USSR and elsewhere is included. Important therapeutic preparations used in pond fishery are compiled with an extensive bibliography. Diseases discussed are infectius, parasitic, those caused by infusoria, by helminths, by larvae of trematodes, by Crustacea, noncommunicable diseases (alimentary and functional), traumatic damage, and diseases caused by deterioration of rearing conditions, and diseases of unknown etiology. A chapter is devoted to pathological examination methods; bacteriological examination; media preparation, preparation and examination of stained preparations, pure cultures, morphological and biochemical properties of microbes, and methods of examination for viruses and for parasitic diseases, including collection, fixation and storage of parasites in addition to formulas of common fixatives and stains. The volume is illustrated, especially in the 100 pages on parasitic diseases. (Jones-Wisconsin)
W74-07481

SOME ESTUARINE FACTORS INFLUENCING ASCENT OF ANADROMOUS CUTTHROAT TROUT IN OREGON,
Oregon State Game Commission, Corvallis.
For primary bibliographic entry see Field 2L.
W74-07493

ABUNDANCE AND MORTALITY OF THE PERCH FRY (PERCA FLUVIATILIS, LINNACUS, 1758) IN THE KLICAVA RESERVOIR,
Karlova Universita, Prague (Czechoslovakia). Inst. of Zoology.
K. Cerny, and K. Pivnicka.
Vestn Cesk Spol Zool. Vol 37, No 1, p 1-13. 1973. Illus.
Identifiers: *Czechoslovakia(Klicava reservoir), Embryo development, Larva development, *Mortality, Perca-Fluviatilis, *Perch fry, Rervoirs.

The abundance of the perch fry in the Klicava reservoir (Czechoslovakia) during the years 1967, 1970, and 1971 was studied. There is a decreasing trend in successive values of all estimations, which is correlated with the initially great and subsequent lower numbers of fish captured. The successive estimated values descend to the final known value. On the basis of 2 consecutive estimations in the year 1971 the value of daily mortality of perch fry was calculated as 0.66%. Mortality values in fry of different fish species when compared among themselves lead to the conclusion that the values in the embryonal and larval development periods fluctuate considerably. After these periods (in the juvenile period) daily mortality is stable and similar in different fish species.--Copyright 1973, Biological Abstracts, Inc.
W74-07588

POPULATION DENSITY, BIOMASS AND MAXIMUM NATALITY RATE AND FOOD CONDITIONS IN LIGIDIUM HYPNORUM L. (ISOPODA),
Polish Academy of Sciences, Warsaw. Inst. of Ecology.
A. Stachurski.
Ekol Pol. Vol 20, No 19, p 185-198. 1972. Illus.
Identifiers: Biomass, Fecundity, Food, *Isopoda, Ligidium-Hypnorum, *Natality rate, *Population density(Isopods).

The influence of food resources of a habitat on the density, biomass, sex and age structure, condition and fecundity of populations of L. hypnorum was studied. Better food conditions gave higher density and biomass; and greater percentage of females and young individuals in the population resulted in greater maximum natality rate of the population.--Copyright 1973, Biological Abstracts, Inc.
W74-07590

FERTILITY OF THE FISH FROM VARVARA RESERVOIR, (IN RUSSIAN),
Yu. A. Abdurakhmanov.
Dokl Akad Nauk Az SSR. Vol 27, No 10, p 81-84, 1971. English summary.
Identifiers: Abramis-brama, Cyprinus-carpio, *Fertility(Fish), Length, Reservoir, Rutilus-rutilus-caspicus, *USSR(Varvara reservoir), Weight.

The fertility of Rutilus rutilus caspicus varies from 14.8 to 67.3 (average 33.3), Cyprinus carpio-from 45.3 to 276.9 (average 121.3) and Abramis brama-from 13.8 to 55.9 (average 32.5) thousands of spawn. The fertility of Cyprinus carpio and Abramis brama in Varvara reservoir USSR is diminished in connection with earlier ripen under low length and weight.--Copyright 1973, Biological Abstracts, Inc.
W74-07591

FOOD SUPPLY AND CHARACTER OF ITS UTILIZATION BY DNIESTER VIMBA FRY IN PONDS, (IN RUSSIAN),
M. Z. Vladimirov, and A. I. Naberezhnyi.
Izv Akad Nauk Mold SSR Ser Biol Khim Nauk. 6 p, 45-48, 1971.

Identifiers: Character, Cladocera, Copepods, Food, Hydrobionts, Intestine, Ponds, Rotifers, *Vimba fry, Vimba-vimba, *USSR(Dniester), *Fishery.

The food base was studies in 2 ponds of the Dniester, USSR, fishery in which vimba (Vimba-vimba) fry were cultivated and the contents of 170 intestines of larvae and fingerlings were analyzed. The food spectrum of the fry included 49 components of planktonic and benthic fauna with a predominance of rotifers, caldocerans and copepods.--Copyright 1973, Biological Abstracts, Inc.
W74-07592

EFFECT OF ANHYDROUS AMMONIA ON A CENTRAL TEXAS POND, AND A REVIEW OF PREVIOUS RESEARCH WITH AMMONIA IN FISHERIES MANAGEMENT,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-07595

ON THE COMPOSITION OF MIXED FODDER RATIONS FOR TROUT IN NET CAGES, (IN GERMAN),
Munich Univ. (West Germany). Institut fuer Physiologie und Ernaehrung der Tiere.
J. Tiews, J. Gropp, H. Koops, and K. Tiews.
Z Tierphysiol Tierernaehr Futtermittelkd. Vol 29, No 6, p 267-275, 1972. Illus. English summary.
Identifiers: Corn(Field), Fish fodder, Rations, Soy, Starch, *Trout, Vitamins, *Fish cages.

Feeding experiments with trout in net cages were carried out in fresh water or coastal water (NaCl = 12-18%,respectively). A 92 g weight gain in 123 days was obtained with a ration containing 42% crude protein (3/4 derived from fishmeal) and 15% cooked corn starch. The addition of 15% untreated corn starch to the ration lowered the weight gain to 80 g and decreased feed efficiency (1.74) significantly, indicating that raw starch is poorly utilized by the fish, probably due to a lack of amylase-activity in the intestines. Even the 49% protein basal ration (without additional starch) resulted only in 86 g weight gain and a feed efficiency of 1.60, indicating that part of the protein may have served for energetic purposes in the metalolism of trout. All rations were supplemented with synthetic vitiams. Omitting the vitamins did not decrease weight gain and feed conversion in the first 100 days of the experiment, but later the appetite declined drastically. Cooked starch is better utilized than raw starch by the trout, and 42% crude protein in the trouts' ration is preferable to 32%. There was not a very large difference between protein of animal (fishmeal) or plant (soy) origin in the various protein levels. The best results (141 g weight gain in 76 days; feed conversion 1.46) were obtained with a 40% protein level in the ration, mainly derived from fishmeal. Therefore, commercial trout feeds should contain at least 40% crude protein derived from high quality fishmeals.--Copyright 1973, Biological Abstracts, Inc.
W74-07599

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT/FISCAL YEAR 1973.
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 9D.
W74-07252

EIGHTH ANNUAL REPORT, PROGRAM ACTIVITIES, JULY 1, 1971-JUN 30, 1972.
Maryland Univ., College Park.
For primary bibliographic entry see Field 9D.
W74-07332

MINUTES, IOWA STATE WATER RESOURCES RESEARCH INSTITUTE ADVISORY BOARD AND COUNCIL, EIGHTH ANNUAL MEETING.
Iowa State Water Resources Research Inst., Ames.
Available from the National Technical Information Service as PB-231 915; $6.00 in paper copy, $1.45 in microfiche. 50 p, September 1973. OWRR A-999-IA(7).

Descriptors: Water resources research act, *Iowa, Research and development, *Universities, *Water resources institute, *Research priorities, Projects.

This report contains the minutes of the Eighth Annual Meeting of the Iowa State Water Resources Research Institute Advisory Board and Council. A review paper, 'Water problems and related research needs in the State of Iowa,' contains identification of major problem areas and identification of high priority research of an interdisciplinary and regional nature. Comments and suggestions were made by advisors on current projects and on identifying high priority research areas. A list of completed projects and a list of current projects are included. (Knapp-USGS)
W74-07456

NINTH ANNUAL REPORT OF THE WATER RESOURCES RESEARCH INSTITUTE OF THE UNIVERSITY OF WYOMING (ACTIVITIES DURING FY 1973).
Wyoming Univ., Laramie. Water Resources Research Inst.
Available from the National Technical Information Service as PB-231 914; $8.75 in paper copy, $1.45 in microfiche. August 1, 1973. 109 p, OWRR A-999-WYO(18).

Descriptors: Water resources research act, *Wyoming, *Research and development, *Universities, *Water resources institute, Research, Training, Colleges, Grants, Projects.
Identifiers: *North Platte basin(Wyo).

The work of the Water Resources Institute at the University of Wyoming during FY 1973 is summarized. The basic focus for the research program of the Institute is the hydrologic and economic simulation models of the North Platte basin. Largely through the efforts of the Water Resources Research Institute, the University of Wyoming began offering work towards a degree of Master of Science in Water Resources in September 1966. (Knapp-USGS)
W74-07457

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT/FISCAL YEAR 1973.
Delaware Univ., Newark. Water Resources Center.
Available from the National Technical Information Service as PB-231 794, $6.50 in paper copy, $1.45 in microfiche. 1973. 49 p. OWRR A-999-DEL(5).

Descriptors: *Delaware, *Water Resources Institute, *Research, *Universities, Training, Colleges, Water resources development.

Delaware's principal natural resource is ground water, plentiful in its southern counties (Kent and Sussex) but becoming scarcer in northern New Castle County. Affinity was established between water availability and geologic features in the rock aquifers, resulting in new producing wells in the Newark water-short area. Well-development possibilities became predictable by gamma-ray logs of test holes in coastal plain aquifers characterized by alternate layers of sand and clay. The Delaware Water Resources Center's work has stimulated public and governmental debate on single (large) versus regional (small) sewage treatment facilities, and on a new reservoir versus water-recycling plants. A Christina River Basin Study resulted in a flood-plain ordinance for Newark; a proposed erosion and sedimentation control ordinance for New Castle County; and distribution of a public information brochure on water conservation in developing areas. It also enlisted the guidance of a very distinguished Citizens' Council chaired by a former Delaware Governor and Senator in Washington. The Center is helping to find a solution to pollution of a large coastal aquifer by leachate from an old sanitary landfill. Affected are about 150,000 customers of a privately owned water company using the aquifer. (Varrin-Delaware)
W74-07252

EIGHTH ANNUAL REPORT, PROGRAM ACTIVITIES, JULY 1, 1971-JUN 30, 1972.
Maryland Univ., College Park.
Available from the National Technical Information Service as PB-231 804 $7.25 in paper copy, $1.45 in microfiche. Water Resources Research Center. 1972. 91p. OWRR A-999-MD (8).

Descriptors: *Water resources development, *Water Resources Institute, *Maryland, Bibliographies, *Projects, Reviews, *Universities, State governments, Water pollution, Grants, Training, Colleges, Publications.
Identifiers: Projects progress report.

Projects in progress during the 1972 FY by the Water Resources Research Center of the University of Maryland include: the thermal requirements and tolerance of key estuarine organisms; agricultural waste water accomodation and utilization by various forages; mechanism of organic adsorption on activated carbon; the transient behavior of recharge-discharge areas in regional groundwater systems; a statistical investigation and simulation of hydroclimatological events; pollution loads in percolate water from surface spread swine wastes; bacterial degradation of arylsulfonates in treatment of waste water; analysis of time variant waste treatment systems; chlorinated sewage effluents and avoidance reaction of stream fish; effects of economic development upon water resources; biogeochemistry of estuarine ecosystem with emphasis on heavy metals and shellfish; the effects of thermal loading and water quality on estuarine primary production; and the role of organic debris and associated microorganisms in pelagic estuarine food chains. (Woodard-USGS)
W74-07332

MINUTES, IOWA STATE WATER RESOURCES RESEARCH INSTITUTE ADVISORY BOARD AND COUNCIL, EIGHTH ANNUAL MEETING.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 9A.
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

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- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

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4 WATER QUANTITY MANAGEMENT AND CONTROL

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